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ABSORPTION OF DF, HF, AND IODINE LASER RADIATION

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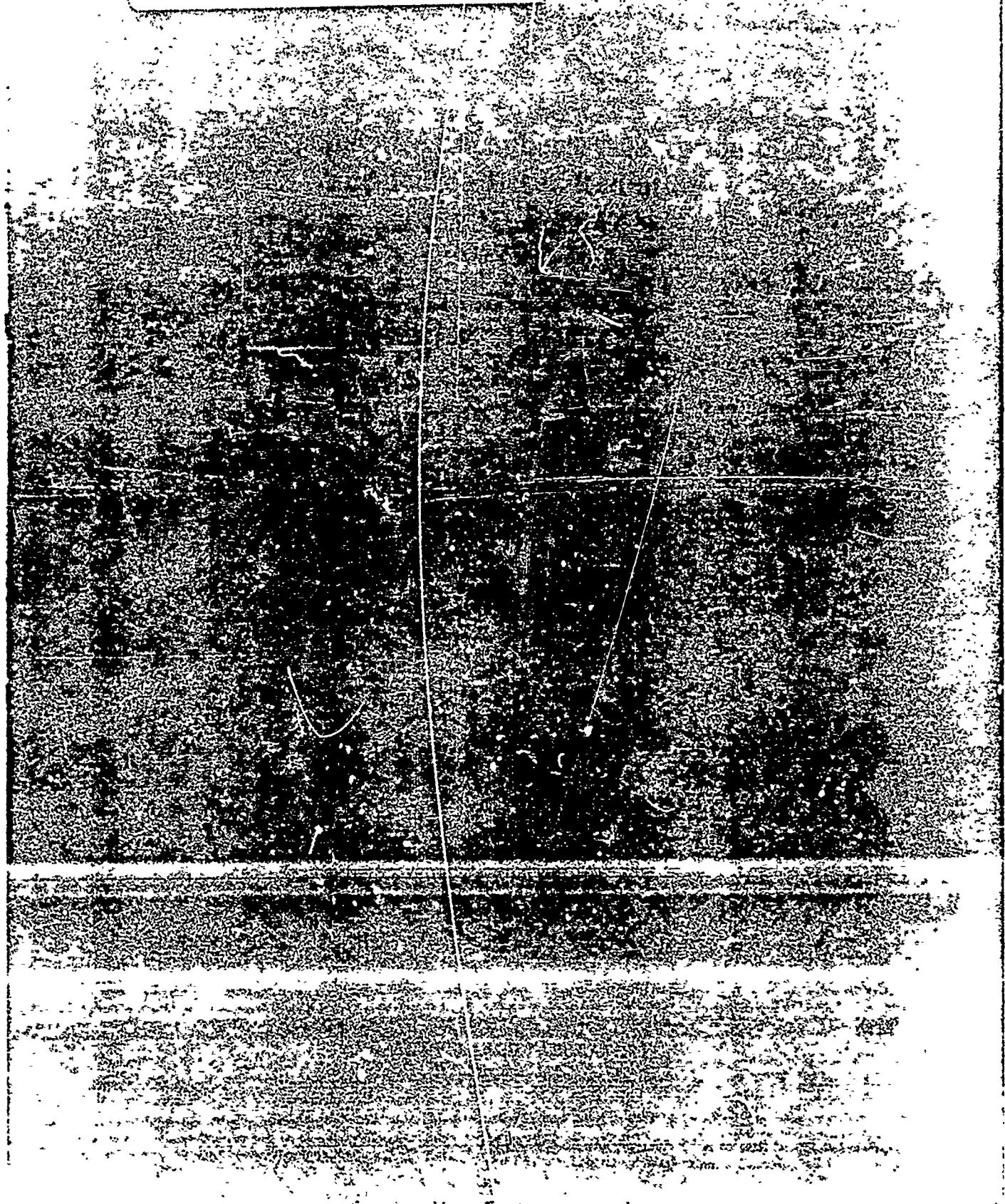
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## ALTITUDE-DEPENDENT ATMOSPHERIC ABSORPTION OF DF, HF, AND IODINE LASER RADIATION

### I. INTRODUCTION

The Applied Optics Branch of NRL's Optical Sciences Division has been actively involved for the past ten years or so with the accurate characterization of the atmospheric effects on laser propagation. Previous work has centered on measurements of Helium-Neon at  $0.6328 \mu\text{m}$ , Nd-YAG at  $1.06 \mu\text{m}$ , Deuterium-Fluoride (DF) at  $3.5\text{-}4.2 \mu\text{m}$ , CO at  $4.9\text{-}5.4 \mu\text{m}$ , and CO<sub>2</sub> at  $9\text{-}11 \mu\text{m}$ . These lasers operate in spectral regions where absorption by atmospheric gases is relatively weak, the so-called atmospheric windows. The DF laser has shown to be of great interest for Naval use at sea level, primarily due to the small molecular extinction at  $3.5\text{-}4.2 \mu\text{m}$ , relative to the other windows, and due to the high optical power available from the DF chemical reaction.

The DF molecule is formed in excited vibration-rotation states ( $\nu', J'$ ) when deuterium and fluorine combine. The emitted radiation leading to lasing results during the relaxation  $\nu' \rightarrow \nu'-1, J' \rightarrow J'-1$ . The laser line P<sub>2</sub>(8), for example, results from the transition  $\nu: 2 \rightarrow 1, J: 8 \rightarrow 7$ .

Even more energy per kg of fuel is available in the reaction using normal hydrogen and fluorine to form HF, with the resulting emission centered near  $3.8 \mu\text{m}/\sqrt{2} \approx 2.7 \mu\text{m}$ . Unfortunately, for atmospheric propagation, this spectral region is dominated by absorption due to the atmospheric water vapor H<sub>2</sub>O fundamental vibration centered at  $2.7 \mu\text{m}$ . Where DF laser propagation *at sea level* will typically lose 1-10% of its output *per km* of path (depending strongly on which particular line we consider), the corresponding HF laser output will typically lose 1-10% of its output *per meter* of path, again depending strongly on which laser line we consider. Hence, even though HF yields about twice the power of DF per kg of fuel, the HF atmospheric absorption *at sea level* is about 1000 times that of DF.

The concentration of atmospheric water vapor decreases with altitude much more rapidly than other atmospheric gases, due to the decreasing temperature. The possibility thus exists that profitable use may be made of a platform-mounted HF laser if the upper altitude H<sub>2</sub>O absorption is small enough. The obvious question is, "what is small enough"? This is left to future study, but what this work addresses is:

- (1) accurately calculate HF and DF laser line absorption for a typical atmosphere for 0-15 km altitude.
- (2) include a large set of HF and DF laser line frequencies (62 and 104 respectively) such that lines not normally excited in cw laser devices may never-the-less be examined for absorption.
- (3) fully describe and document the data bases employed in the calculations, both absorption line frequencies and laser emission frequencies

- (4) compare the results with available measurements and calculations.

In Chapter 2 we briefly describe the line-by-line method for high resolution transmittance calculations (generic HITRAN). We list the pertinent assumptions in the NRL code. We detail the origin and accuracy of the laser line frequencies.

The results for 62 HF and 104 DF frequencies are presented, at each of 16 layers, in tabular form in Appendices C and D. Both the absorption coefficient  $k$  ( $\text{km}^{-1}$  units) and the transmittance  $T = e^{-kL}$  for a one kilometer path  $L$  are listed. Several important lines are compared with previous work, and several plots of  $k$  vs altitude are presented in Chapter 3.

Chapter 4 describes the effect of considering the variation in the line-to-line output power spectral distribution which occurs in multiline devices. Chapter 5 discusses some important future work needed to extend and apply the results presented here.

This study presents little that is new as far as analytic methods of calculation, and much credit is due to previous work as noted in the References. We do however, give some new results:

- (1) altitude dependent absorption profiles using up-to-date absorption line parameters.
- (2) use of many new HF and DF line frequencies, principally applicable to outputs of modern pulsed devices.
- (3) a review of spectral output distributions and their effect on propagation.

We hope that the currentness and broad scope will make the results useful to a large number of users in the HEL propagation community.

## II. ABSORPTION CALCULATION METHODOLOGY

### A. Review of the HITRAN Method

The absorption coefficient  $k(\nu)$  at frequency  $\nu$  is the sum of contributions from absorption lines centered at all other frequencies  $\nu'$ . We employ the usual assumption of a Lorentz lineshape for infrared transitions at atmospheric pressure:

$$k_L(\nu) = \frac{1}{\pi} \frac{Syu}{(\nu - \nu')^2 + \gamma^2} \quad (1)$$

Where  $S$  is the integrated line absorption strength ( $\text{cm}^{-1}/\text{molecule/cm}^2$ ),  $\gamma$  is the pressure-dependent HWHM linewidth, and  $(\nu - \nu')$  is the spectral separation of the line center ( $\nu'$ ) from the frequency of interest ( $\nu$ ). The optical density of absorbing molecules is given by  $u$ , the product of the number density ( $\text{molecules/cm}^3$ ) and the path length (cm). As described in detail in the material accompanying the AFGL absorption line Atlas (1,2),  $S$ ,  $\gamma$ ,  $\nu'$ , and  $E''$  (the lower state energy which affects the temperature dependence) are all species ( $i$ ) and frequency ( $j$ ) dependent. The optical thickness,  $u$ , also depends on species via the atmospheric concentration. Assuming a homogeneous path the net absorption coefficient at frequency  $\nu$  is given by:

$$k_j(\nu) = \sum_{i=1}^j \sum_{n \neq n_i} \frac{1}{\pi} \frac{S_i \gamma_{ii} u_i}{(\nu - \nu'_{ii})^2 + (\gamma_{ii})^2} \quad (2)$$

The pressure-dependent linewidth  $\gamma_n$  is given by:

$$\gamma_n = \gamma \left[ \frac{P_{\text{atm}}}{760} + b_s P_1 \right] \quad (3)$$

where  $b_s$  is the self-to-foreign broadening ratio (5.0 is assumed for water vapor). Details of the broadening mechanisms and assumed coefficients will not be repeated here, and the reader is referred to the references for specifics.

In practice the  $\int$  sum in Eq. (2) is truncated to include only lines within a reasonable separation from the frequency  $\nu$ . The NRL HITRAN program uses  $\pm 20 \text{ cm}^{-1}$  for the bound on  $(\nu - \nu')$ . The truncation error for a line of unit strength and typical (sea-level)  $\gamma$  of  $0.07 \text{ cm}^{-1}$  is less than 0.02% maximum and the truncation error decreases rapidly with decreasing pressure. Nevertheless the cumulative effect in the far wings of H<sub>2</sub>O lines is probably responsible for the continuum absorption of H<sub>2</sub>O and we discuss this important effect shortly. We also point out that the assumption of linearity implicit in the summation in (2) over the same species does not strictly apply. The non-Lorentzian appearance of absorption lines, in the oxygen bands at 60 and 120 GHz, and in the CO<sub>2</sub> band head at  $4.18 \mu\text{m}$  may be a manifestation of the following effect: superposition does not strictly hold when energy level spacing is less than a pressure broadened line-width (3). We mention this topic because the spectral region of interest in the present study encompasses both the  $4.2 \mu\text{m}$  CO<sub>2</sub> band and the dense H<sub>2</sub>O band at  $2.7 \mu\text{m}$ . A previous study required super-Lorentz lineshapes to obtain curve-fits to pressure dependent, single frequency measurements at  $2.7 \mu\text{m}$  (4-6). We choose to defer further discussion of this interesting phenomena until more experimental data is available, and we point out that the results presented here were computed using the usual Lorentz (and Voigt) lineshape.

The atmospheric pressure (sea-level) line-width varies from about  $0.03$  to  $0.10 \text{ cm}^{-1}$  depending on species. At reduced pressures the collision frequency is negligible compared to the Doppler shift frequency spread  $\gamma_D$  given by:

$$\frac{\gamma_D}{\nu} = 3.58 \times 10^{-7} \sqrt{T/M} \quad (4)$$

For temperatures encountered in this study the Doppler widths vary from  $0.0016 \text{ cm}^{-1}$  for CO<sub>2</sub> at 15 km altitude to  $0.0063 \text{ cm}^{-1}$  for CH<sub>4</sub> at sea level. The pure-Doppler lineshape applies for pressures less than about 10 torr:

$$k_D(\nu) = \frac{\sqrt{\ln 2}}{\pi \gamma_D^2} \exp \left[ - \frac{(\ln 2)}{\gamma_D^2} (\nu - \nu')^2 \right] \quad (5)$$

The assumed atmospheric profile employs a pressure variation of 760 to 98 torr for 0 to 15 km altitude. At 98 torr total pressure the Doppler and Lorentz half widths are within an order of magnitude since the Lorentz width decreases with pressure. The proper way to combine the two effects is using the Voigt lineshape (7) which is the convolution of the two:

$$k_v(\nu) = \frac{\nu \sqrt{\ln 2}}{\pi \nu_B} \int_{-\infty}^{\infty} \frac{e^{-t^2} dt}{y^2 + (z-t)^2} \quad (6)$$

where

$$y = \frac{\gamma_L}{\gamma_D} \sqrt{\ln 2}$$

and

$$z = \frac{\nu - \nu'}{\gamma_D} \sqrt{\ln 2}$$

The NRL HITRAN Program uses the Voigt routine from the AFGL program FASCODE (8). Standard assumptions (1) regarding temperature effects on linewidth, molecular number density, and use of the Burch water vapor continuum are made. The usual H<sub>2</sub>O self-to-foreign broadening ratio of 5 is used with no line-to-line variation.

The DF laser spectral region also requires consideration of the N<sub>2</sub> continuum, due to collision-induced absorption. This effect depends on the number of N<sub>2</sub> molecules present, and on the collision rate, hence as the square of the nitrogen partial pressure. The N<sub>2</sub> continuum is centered near 2330 cm<sup>-1</sup>, within the CO<sub>2</sub> ν<sub>3</sub> band, but extends both above and below the CO<sub>2</sub> feature. At 4.215 μm the N<sub>2</sub> continuum absorption, at sea level, is about 0.10 km<sup>-1</sup>, and decreases to less than 0.001 km<sup>-1</sup> at the high frequency end of the DF region.

We point out that the program FASCODE (Fast Atmospheric Signature Code) from AFGL is specifically designed for varying lineshape altitude dependence, path refraction, radiance contributions, and many additional subtle features not required in the present study.

### B. Laser Line Frequencies

We have primarily used the HF and DF laser line frequencies of Sengupta, Das and Rao (9), which can probably be assumed accurate to 0.001 cm<sup>-1</sup>. About 1/3 of the laser frequencies reported here were not accessible to the OSU group. For these we used Wilkens' (10) values calculated from published Dunham coefficients and isotopic relations. These are accurate to about 0.02 cm<sup>-1</sup>.

### C. Assumed Atmospheric Profile

Table I and Figs. 1-3 summarize the altitude profile we have used for total pressure, water vapor partial pressure (50% relative humidity), and temperature. This is the same profile used by the WSMR study (4-6), and we chose to use the same profile so we could compare our results with the results they present for seven HF lines. Results for some HF lines and many DF lines were presented in the 1978 AFGL LASER report (11), for 2 altitudes, but these are based on results calculated using the 1978 tape and prior to the new HF and DF laser line frequencies. Our results use the 1980 tape and the recent laser frequencies.

We have not treated the important subject of aerosol scattering, and the interested reader can find useful material in the LASER documentation.

## III: RESULTS AND DISCUSSION

HF and DF Laser absorption tables are presented in tabular form in the Appendices. Previous work has centered on calculation of 7 HF absorption coefficients and comparison with measurements (4-6), and calculation of several HF and many DF lines with the 1962 US Standard Atmosphere (11). As discussed previously, we chose the 50% relative humidity atmosphere profile so we could compare our results with the seven HF lines in the ASL work. This comparison is made in Table II.

Table 1 — Assumed 50% Relative Humidity Altitude Profile

Altitude (km)	Temp (°C)	Total Pressure (torr)	H <sub>2</sub> O Pressure (torr)
0	21	760.0	9.325
1	17	676.6	7.265
2	12	601.7	5.260
3	6	532.7	3.507
4	0	471.2	2.290
5	-6	415.6	1.383
6	-12	365.4	0.816
7	-18	319.6	0.470
8	-25	279.1	0.238
9	-31	243.1	0.130
10	-38	210.8	0.0605
11	-44	182.3	0.0305
12	-51	156.8	0.0132
13	-57	134.3	0.0061
14	-57	114.8	0.0061
15	-57	97.5	0.0061

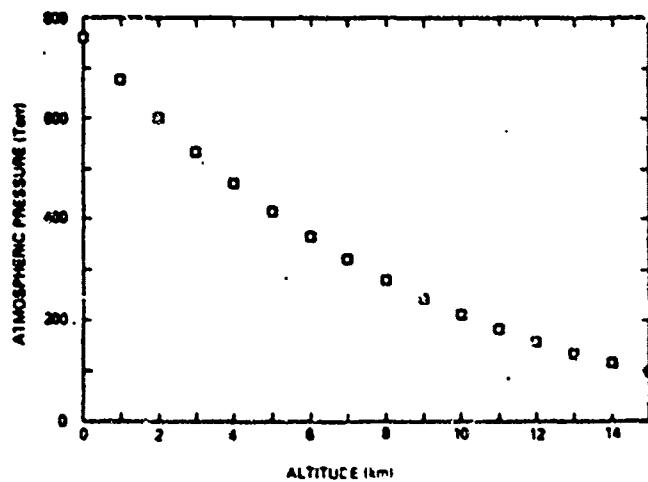


Fig. 1 — Atmospheric pressure profile

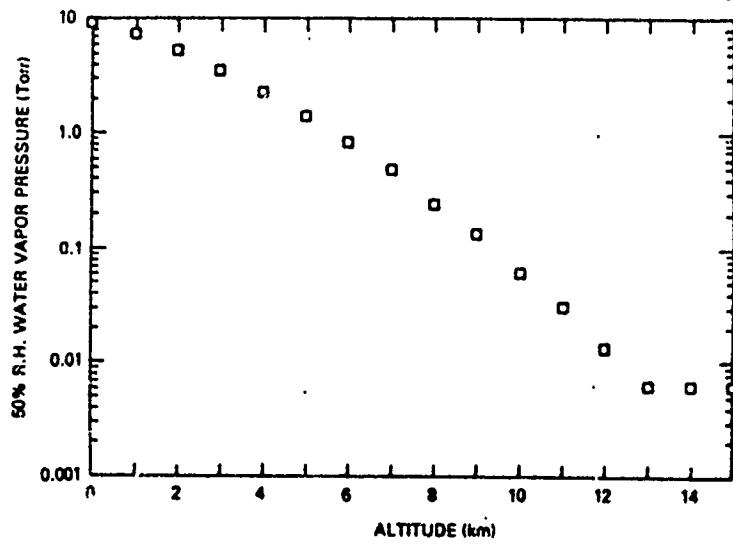


Fig. 2 — Water vapor pressure profile (50% relative humidity)

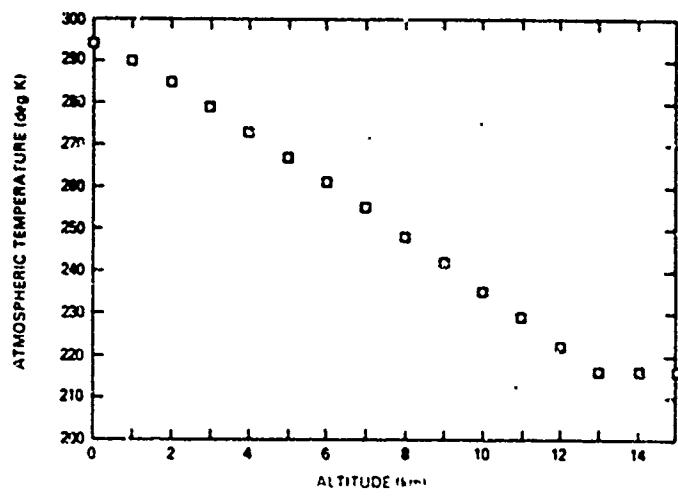


Fig. 3 — Atmospheric temperature profile

Table II. HF Laser Line Absorption Coefficients, Comparison of this Study and Ref. (4)

HF Line	Ref	0 km	5 km	10 km	15 km	$\nu$ (cm $^{-1}$ )
P <sub>1</sub> (4)	NRL	7.9 km $^{-1}$	1.0 km $^{-1}$	4.2 E-2 km $^{-1}$	3.1 E-3 km $^{-1}$	3788.370
	(4)	9.5	0.9	3.0 E-2	1.5 E-3	3788.2253
P <sub>1</sub> (6)	NRL	99	13.1	0.63	6.7 E-2	3693.4130
	(4)	130	16	0.75	8.5 E-2	3693.4226
P <sub>1</sub> (7)	NRL	26	3.1	0.26	3.6 E-2	3644.1430
	(4)	39	5.0	0.50	8 E-2	3644.1454
P <sub>2</sub> (5)	NRL	43	5.4	0.66	0.21	3577.4970
	(4)	45	5.0	0.70	0.30	3577.5002
P <sub>2</sub> (6)	NRL	30	2.3	5.3 E-2	5.8 E-3	3531.1705
	(4)	36	2.5	6.0 E-2	7.5 E-3	3531.1747
P <sub>2</sub> (7)	NRL	4.1	0.31	8 E-3	6 E-4	3483.6515
	(4)	4.7	0.35	9 E-3	9 E-4	3483.6522
P <sub>2</sub> (8)	NRL	0.49	3.9 E-2	1 E-3	2 E-4	3434.9949
	(4)	0.45	3.8 E-2	1 E-3	2 E-4	3434.9994

The agreement is generally within 15%, with the NRL values equal to or less than the ASL values. It is difficult to draw conclusions based on only these seven HF lines, but the numbers presented in this study can probably be used with 15% error bars confidently. The experimental work performed at ASL concluded that the self-to-foreign broadening ratio for H<sub>2</sub>O absorption half-widths was variable in the range of 5-8. Since very few, if any, laser lines are exactly coincident with H<sub>2</sub>O absorption lines, the line broadening effect they propose would lead to an average increase in the wing absorption. Hence we would, on the average, expect their values to be somewhat higher than ours, since we used a self-to-foreign ratio of 5 exclusively.

Figures 4-6 are plots of absorption coefficient vs altitude for HF P<sub>2</sub> (8), P<sub>2</sub> (7), and P<sub>1</sub> (7), using the data presented in the previous section. The fall-off of absorption with altitude generally follows the H<sub>2</sub>O partial pressure altitude profile, but we point out that the line shape narrows with altitude increase. The Doppler component of the Voigt lineshape narrows with decreasing temperature, as does the Lorentz component. The high density of H<sub>2</sub>O lines in the HF region precludes the use of a simple single-line model. Hence studies of HF absorption at the complete range of humidities will require a large number of line-by-line computations. We would expect, for 20% accuracy, that polynomial expressions for HF absorption could be developed, as has been done successfully in the past for other monochromatic absorption coefficients (12, 13, and reference's cited herein). One example of such a polynomial expression is given in equation (7) below:

$$\begin{aligned}
 k = & A_0 + A_1 T + A_2 P + A_3 TP \\
 & + A_4 P^2 + A_5 TP^2 + A_6 T^2 + A_7 T^2 P \\
 & + A_8 T^2 P^2
 \end{aligned} \tag{7}$$

The nine constants A<sub>0</sub>, ..., A<sub>8</sub> are generated with a fitting routine from a set of HITRAN results at various temperatures T, and partial pressures P.

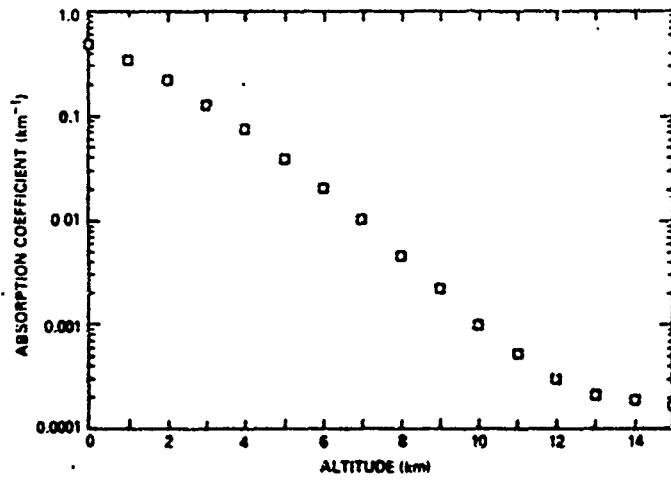


Fig. 4 — HIF P<sub>2</sub>(8) absorption vs altitude

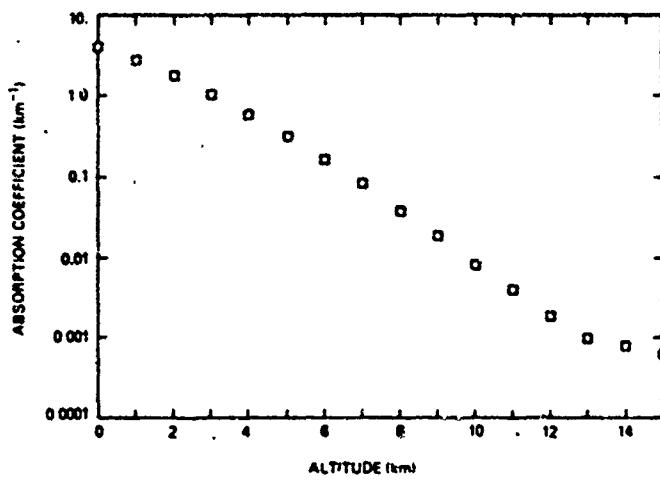


Fig. 5 — HIF P<sub>2</sub>(7) absorption vs altitude

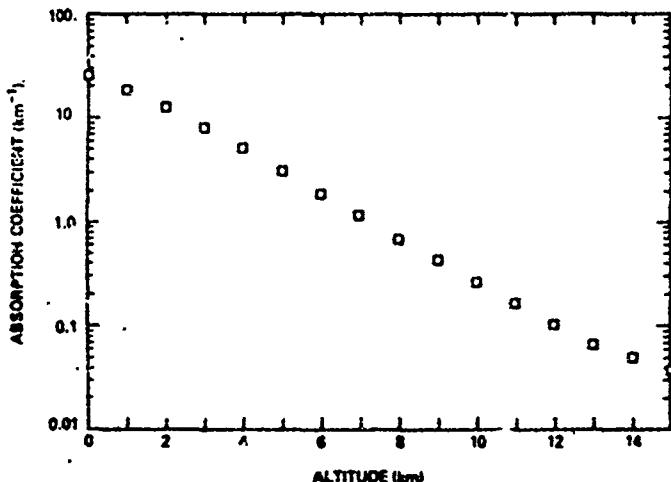


Fig. 6 -- HF P<sub>1</sub>(7) absorption vs altitude

Another conclusion obvious from Figures 4-6 is that the very high HF absorption at sea level becomes quite modest above 6 km or so. Of course aerosol scattering for very long paths will also contribute, but clearly the HF laser water vapor absorption problem diminishes quite rapidly with altitude.

#### IV. OUTPUT POWER SPECTRAL DISTRIBUTION

The spectral distribution of atmospheric absorption lines is indeed complicated. A point often overlooked, however, is that the output power spectrum from multiline lasers is also complex. We tend to focus attention on single-line absorption phenomena when it is the net absorption we wish to minimize. We can represent this by

$$k_{\text{net}} = \sum f_i k_i \quad (8)$$

where  $f_i$  is the power fraction emitted into the  $i$ th laser line, and  $k_i$  is the atmospheric absorption coefficient of that line. In the DF laser region this multiline analysis is very important due to the CO<sub>2</sub> band head absorption feature at 2396 cm<sup>-1</sup>. The atmospheric absorption changes by about five orders of magnitude over a narrow spectral region of a few wavenumbers. Significant absorption in this region can lead to deleterious non-linear phenomena such as thermal blooming.

Table III presents some sample spectral distributions. The observed distribution depends strongly on fuel flow rates, pulsed vs cw operation, and optical coating spectral properties, to name just some of the variables. The Lumonics device is a commercially available pulsed device operating on SF<sub>6</sub> fuel and is electric discharge initiated. The other DF devices are all combustion driven chemical lasers. Table IV gives the data for the Lumonics HF device. State-of-the-art e-beam pulsed DF lasers have been observed to emit as far out as 5 μm (14). This was the motivation for carrying out the calculations in CH. 3 to such high quantum numbers.

Table V presents the results of applying Eqn. (8) to the DF and HF spectral distributions  $f_i$  presented in Tables III and IV. The absorption coefficients  $k_i$  are from Chapter 3. The computer program DFPWR was written to handle these computations.

Table III.  
Output Power Spectral Distributions from Several DF Lasers

DF Line	Lumonics (15)	MIRACL (16)	BDL (17)	NACL (18)	NRL (19)
P <sub>1</sub> (5)	0.2%				2.4
P <sub>1</sub> (6)	0.9		0.7		3.0
P <sub>1</sub> (7)	2.1		2.1		3.3
P <sub>1</sub> (8)	3.2	7	5.5	0.5	4.1
P <sub>1</sub> (9)	3.7	31	11.0	3.3	3.6
P <sub>1</sub> (10)	3.0	16	6.9	6.9	2.7
P <sub>1</sub> (11)	3.7	4		5.8	
P <sub>1</sub> (12)				8.5	
P <sub>2</sub> (3)	1.4				4.1
P <sub>2</sub> (4)	3.0				6.5
P <sub>2</sub> (5)	4.1				8.0
P <sub>2</sub> (6)	6.9		2.8		9.2
P <sub>2</sub> (7)	4.6		4.8		9.8
P <sub>2</sub> (8)	9.2	11	18.6	3.7	9.8
P <sub>2</sub> (9)	7.6	8	12.4	9.1	7.4
P <sub>2</sub> (10)	5.7	7	6.2	15.9	5.9
P <sub>2</sub> (11)	3.4	1	0.7	15.1	4.7
P <sub>2</sub> (12)	0.2	1		17.4	1.8
P <sub>3</sub> (3)	2.3				
P <sub>3</sub> (4)	3.4				
P <sub>3</sub> (5)	3.9				1.8
P <sub>3</sub> (6)	5.0		2.1		2.1
P <sub>3</sub> (7)	5.5	3	9.7		3.6
P <sub>3</sub> (8)	6.2	4	10.3	6.2	3.3
P <sub>3</sub> (9)	5.0	6	4.1	5.4	1.8
P <sub>3</sub> (10)	3.7	1	2.1	2.2	1.5
P <sub>3</sub> (11)	2.1				
P <sub>3</sub> (12)	0.2				

Table IV. A Pulsed HF Laser Output Power Spectral Distribution (15).

P <sub>1</sub> (4)	0.8%	P <sub>2</sub> (6)	9.7
P <sub>1</sub> (5)	0.0	P <sub>2</sub> (7)	16.1
P <sub>1</sub> (6)	4.0	P <sub>2</sub> (8)	14.5
P <sub>1</sub> (7)	16.1	P <sub>1</sub> (9)	1.6
P <sub>1</sub> (8)	16.1	P <sub>3</sub> (3)	0.4
P <sub>1</sub> (9)	2.0	P <sub>3</sub> (4)	1.6
P <sub>2</sub> (3)	0.4	P <sub>3</sub> (5)	3.2
P <sub>2</sub> (4)	1.6	P <sub>3</sub> (6)	3.2
P <sub>2</sub> (5)	7.3	P <sub>3</sub> (7)	1.2

Table V -- Power-Weighted Absorption Coefficients

Lumonics-DF	MIRACL	BDL	NACL	NRL	Lumonics-HF
0 km .0466 km <sup>-1</sup>	.0461	.0403	.0476	.0406	18.75
5 km .0099	.0108	.0106	.0122	.0083	2.423
10 km .0025	.0037	.0033	.0035	.0021	0.2874
15 km .0025	.0017	.0011	.0010	.0006	0.0645

With the exception of the HF device, the power weighted coefficients are remarkable close to one another. This is primarily due to the fact that the laser power distributions considered here did not include any lines beyond 2400 cm<sup>-1</sup> in the dense CO<sub>2</sub> region. From 2400 to 2800 cm<sup>-1</sup> the H<sub>2</sub>O continuum and N<sub>2</sub> continuum are comparatively flat and tend to smooth out the line-to-line variations when an entire output spectrum is computed. The rather modest absorption of HF at the upper altitude is apparent in the last column of Table V. Again, this is due to the rapidly diminishing H<sub>2</sub>O concentration with altitude.

We expect future results of output power spectra from pulsed DF lasers will be available so a similar analysis can be performed in the critical long wavelength region.

## V. FUTURE WORK

This study was undertaken to obtain long-wavelength absorption coefficients, to examine altitude dependence, and to consider output power spectral variations. As a result of this work we have discovered several interesting areas which might be looked into.

1. Repeat the altitude dependence calculations for the 1962 U.S. Standard Atmosphere for 0 to 100 km, as was done in the LASER report (11). include aerosol extinction.
2. Acquire some spectral data on pulsed DF output distribution. The dramatic increase in absorption beyond 2400 cm<sup>-1</sup> needs to be examined for a real device output.
3. Develop polynomial models, as in Eq. (7), so systems-studies can be undertaken with reasonable computer time expense. Include altitude as a variable.
4. Examine the self-to-foreign broadening ratio of the water vapor halfwidth in the HF region. The ASL work pointed out a variation of 5 to 8, but this was based on data taken with a fixed-line frequency laser. A lineshape study with the tunable laser, such as a color center device or a tunable diode, would contribute valuable data on this important problem.

## ACKNOWLEDGMENTS

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## Appendix A IODINE LASER LINE FREQUENCIES

The Iodine chemical laser, which operates at  $1.315 \mu\text{m}$ , is an attractive candidate for upper atmosphere use. The spectral output is an electronic transition split into six closely spaced (hyper-fine) components. We have employed the frequencies given in a recent Aerospace Corp. report (21).

Table A-1 — Iodine Laser Frequencies and Intensities

LINE	FREQUENCY	% POWER
2-3	7602.81 $\text{cm}^{-1}$	13
2-2	7602.87	15
2-1	7602.90	13
3-4	7603.30	38
3-3	7603.44	17
3-2	7603.51	4

## Appendix B

### IODINE ALTITUDE DEPENDENT ABSORPTION

Table B-1 presents HITRAN results, for the same model atmosphere discussed in Chapter 2, for the iodine laser frequencies at  $1.351 \mu\text{m}$ . In this spectral region there is no continuum absorption, and clearly the transmittance is very high. Since the wavelength is about 2.3 times shorter than DF<sub>1</sub>, aerosol scattering is likely to be  $(2.3)^4$  or about 63 times worse than at DF<sub>1</sub> wavelengths. The effects of aerosol scattering at these altitudes would be a good topic to consider in a follow-on study.

**Table B-1 Iodine Laser Absorption Coefficients ( $\text{km}^{-1}$  units)**  
50% Relative Humidity Model

Altitude	2-3	2-2	2-1	3-4	3-3	3-2
0 km	1.09E-1	1.26E-1	1.58E-1	3.87E-2	3.71E-2	3.82E-2
1	7.74E-2	9.32E-2	1.18E-1	2.67E-2	2.57E-2	2.64E-2
2	5.09E-2	6.45E-2	8.25E-2	1.71E-2	1.64E-2	1.69E-2
3	3.06E-2	4.14E-2	5.29E-2	1.00E-2	9.63E-3	9.89E-3
4	1.80E-2	2.64E-2	3.33E-2	5.76E-3	5.54E-3	5.68E-3
5	9.86E-3	1.56E-2	1.94E-2	3.06E-3	2.94E-3	3.01E-3
6	5.23E-3	9.21E-3	1.11E-2	1.59E-3	1.52E-3	1.56E-3
7	2.70E-3	5.41E-3	6.22E-3	8.02E-4	7.68E-4	7.87E-4
8	1.22E-3	2.83E-3	3.07E-3	3.59E-4	3.43E-4	3.50E-4
9	6.00E-4	1.62E-3	1.64E-3	1.75E-4	1.65E-4	1.69E-4
10	2.55E-4	8.10E-4	7.63E-4	7.44E-5	6.91E-5	7.03E-5
11	1.19E-4	4.45E-4	3.91E-4	3.52E-5	3.18E-5	3.22E-5
12	5.15E-5	2.16E-4	1.83E-4	1.57E-5	1.34E-5	1.34E-5
13	2.53E-5	1.15E-4	9.62E-5	8.01E-6	6.38E-6	6.30E-6
14	2.05E-5	1.18E-4	8.29E-5	6.38E-6	5.17E-6	5.13E-6
15	1.65E-5	1.23E-4	7.16E-5	5.06E-6	4.18E-6	4.16E-6

**Appendix C**  
**HF ABSORPTION TABLES**

0 km ALTITUDE

9.325 TORR H<sub>2</sub>O (IN 760 TORR AT 21.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	2.45E 01	0.000
HF	P01-03	3833.810	8.08E 01	0.000
HF	P01-04	3788.370	7.92E 00	0.000
HF	P01-05	3741.600	2.39E 02	0.000
HF	P01-06	3693.413	9.93E 01	0.000
HF	P01-07	3644.143	2.57E 01	0.000
HF	P01-08	3593.706	7.21E 01	0.000
HF	P01-09	3542.159	6.70E 00	0.001
HF	P01-10	3489.560	1.67E 00	0.199
HF	P01-11	3435.965	5.90E 00	0.003
HF	P01-12	3381.432	3.51E-01	0.704
HF	P01-13	3326.018	1.27E 01	0.000
HF	P01-14	3269.781	5.37E-01	0.584
HF	P01-15	3212.778	1.05E 00	0.351
HF	P02-02	3708.783	2.60E 02	0.000
HF	P02-03	3666.356	2.72E 01	0.000
HF	P02-04	3622.577	8.48E 01	0.000
HF	P02-05	3577.497	4.29E 01	0.000
HF	P02-06	3531.170	3.04E 01	0.000
HF	P02-07	3483.652	4.09E 00	0.017
HF	P02-08	3434.995	4.89E-01	0.613
HF	P02-09	3385.256	5.55E 00	0.004
HF	P02-10	3336.490	1.77E 01	0.000
HF	P02-11	3282.754	3.99E 00	0.018
HF	P02-12	3230.101	1.17E 01	0.000
HF	P02-13	3176.588	7.86E-01	0.456
HF	P03-03	3503.612	5.87E 01	0.000
HF	P03-04	3461.440	5.04E 01	0.000
HF	P03-05	3417.996	1.84E 00	0.159
HF	P03-06	3373.334	1.65E-01	0.848
HF	P03-07	3327.508	1.50E 01	0.000
HF	P03-08	3280.570	2.37E 00	0.094
HF	P03-09	3232.574	3.76E 00	0.023
HF	P03-10	3183.575	4.73E-01	0.623
HF	P03-11	3133.624	6.28E 00	0.002

## 0 km ALTITUDE

9.325 TORR H<sub>2</sub>O (IN 760 TORR AT 21.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	1.01E 01	0.000
HF	P03-13	3031.083	7.91E 00	0.000
HF	P04-03	3344.946	1.29E-01	0.679
HF	P04-04	3304.335	3.61E-01	0.697
HF	P04-05	3262.474	2.04E 00	0.130
HF	P04-06	3219.420	1.01E 02	0.000
HF	P04-07	3175.228	6.13E-01	0.542
HF	P04-08	3129.951	3.42E-01	0.711
HF	P04-09	3083.640	5.99E-01	0.549
HF	P04-10	3036.351	9.25E-01	0.396
HF	P04-11	2988.124	3.24E 00	-0.288
HF	P04-12	2939.006	4.97E-02	0.951
HF	P04-13	2889.039	1.39E-02	0.986
HF	P05-03	3189.783	1.80E-01	0.835
HF	P05-04	3150.685	1.80E-01	0.835
HF	P05-05	3110.367	9.92E 00	0.000
HF	P05-06	3068.880	4.95E-01	0.610
HF	P05-07	3026.272	1.80E 00	0.165
HF	P05-08	2982.592	5.74E-01	0.563
HF	P05-09	2937.889	3.38E-01	0.713
HF	P06-04	2999.911	6.91E-02	0.933
HF	P06-05	2961.081	4.99E-01	0.607
HF	P06-06	2921.320	6.18E-02	0.940
HF	P06-07	2880.451	1.91E-02	0.981
HF	P06-08	2838.307	1.02E-01	0.903
HF	P06-09	2794.710	1.63E-02	0.984
HF	P06-10	2749.487	1.94E-02	0.981

## 1 km ALTITUDE

7.265 TORR H<sub>2</sub>O (IN 677 TORR AT 17.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE* AT 1000 M.
HF	P01-02	3877.860	1.79E 01	0.000
HF	P01-03	3833.810	5.77E 01	0.000
HF	P01-04	3788.370	5.87 E 00	0.003
HF	P01-05	3741.600	1.70E 02	0.000
HF	P01-06	3693.413	7.52E 01	0.000
HF	P01-07	3644.143	1.86E 01	0.000
HF	P01-08	3593.706	5.05E 01	0.000
HF	P01-09	3542.159	4.66E 00	0.009
HF	P01-10	3489.560	1.15E 00	0.316
HF	P01-11	3435.965	4.59E 00	0.010
HF	P01-12	3381.432	2.41E-01	0.786
HF	P01-13	3326.018	1.02E 01	0.000
HF	P01-14	3269.781	3.74E-01	0.688
HF	P02-05	3212.778	7.51E-01	0.472
HF	P02-02	3708.783	1.44E 02	0.000
HF	P02-03	3666.356	1.92E 01	0.000
HF	P02-04	3622.577	7.01E 01	0.000
HF	P02-05	3577.497	3.13E 01	0.000
HF	P02-06	3531.170	2.11E 01	0.000
HF	P02-07	3483.652	2.81E 00	0.060
HF	P02-08	3434.995	3.42E-01	0.711
HF	P02-09	3385.256	3.93E 00	0.020
HF	P02-10	3334.490	1.23E 01	0.000
HF	P02-11	3282.754	2.85E 00	0.058
HF	P02-12	3230.101	8.67E 00	0.000
HF	P02-13	3176.588	5.64E-01	0.569
HF	P03-03	3503.612	4.19E 01	0.000
HF	P03-04	3461.440	3.80E 01	0.000
HF	P03-05	3417.996	1.28E 00	0.278
HF	P03-06	3373.334	1.12E-01	0.894
HF	P03-07	3327.508	1.10E 01	0.000
HF	P03-08	3280.570	1.72E 00	0.179
HF	P03-09	3232.574	2.72E 00	0.066
HF	P03-10	3183.575	3.38E-01	0.713
HF	P03-11	3133.624	4.60E 00	0.010
HF	P03-12	3082.776	7.40E 00	0.001
HF	P03-13	3031.023	5.62E 00	0.004
HF	P04-03	3344.946	8.73E-02	0.916

## 1 km ALTITUDE

7.265 TORR H<sub>2</sub>O (IN 677 TORR AT 17.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER ( $\mu/\text{cm}$ )	EXTINCTION ( $\text{l}/\text{km}$ )	TRANSMITTANCE AT 1000 M.
HF	P04-04	3304.335	2.55E-01	0.775
HF	P04-05	3262.474	1.60E 00	0.203
HF	P04-06	3219.420	8.73E 01	0.000
HF	P04-07	3175.228	4.42E-01	0.643
HF	P04-08	3129.951	2.42E-01	0.785
HF	P04-09	3083.640	4.24E-01	0.654
HF	P04-10	3036.351	6.48E-01	0.523
HF	P04-11	2988.124	8.60E-01	0.423
HF	P04-12	2939.696	3.75E-02	0.963
HF	P04-13	2889.039	1.06E-02	0.989
HF	P05-03	3189.783	1.30E-01	0.878
HF	P05-04	3150.685	1.27E-01	0.881
HF	P05-05	3110.367	7.91E 00	0.000
HF	P05-06	3068.880	3.61E-01	0.697
HF	P05-07	3026.272	1.29E 00	0.276
HF	P05-08	2982.592	4.02E-01	0.669
HF	P05-09	2937.889	2.67E-01	0.765
HF	P06-04	2999.911	4.88E-02	0.952
HF	P06-05	2961.081	3.43E-01	0.710
HF	P06-06	2921.320	5.17E-02	0.950
HF	P06-07	2880.451	1.41E-02	0.986
HF	P06-08	2838.307	7.45E-02	0.928
HF	P06-09	2794.710	1.31E-02	0.987
HF	P06-10	2749.487	1.73E-02	0.982

## 2 km ALTITUDE

5.260 TORR H<sub>2</sub>O (IN 602 TORR AT 120 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	1.23E 01	0.000
HF	P01-03	3833.810	3.84E 01	0.000
HF	P01-04	3788.370	4.10E 00	0.017
HF	P01-05	3741.600	1.13E 02	0.000
HF	P01-06	3693.413	5.31E 01	0.000
HF	P01-07	3644.143	1.26E 01	0.000
HF	P01-08	3593.706	3.28E 01	0.000
HF	P01-09	3542.159	3.01E 00	0.049
HF	P01-10	3489.560	7.33E-01	0.480
HF	P01-11	3435.965	3.23E 00	0.040
HF	P01-12	3381.432	1.52E-01	0.859
HF	P01-13	3326.018	7.54E 00	0.001
HF	P01-14	3269.781	2.41E-01	0.786
HF	P01-15	3212.778	5.05E-01	0.604
HF	P02-02	3708.783	9.77E 01	0.000
HF	P02-03	3666.356	1.26E 01	0.000
HF	P02-04	3622.577	5.71E 01	0.000
HF	P02-05	3577.497	2.14E 01	0.000
HF	P02-06	3531.170	1.34E 01	0.000
HF	P02-07	3483.652	1.73E 00	0.168
HF	P02-08	3434.995	2.20E-01	0.803
HF	P02-09	3385.256	2.58E 00	0.076
HF	P02-10	3334.490	7.79E 00	0.000
HF	P02-11	3282.754	1.88E 00	0.153
HF	P02-12	3230.101	6.00E 00	0.002
HF	P02-13	3176.588	3.79E-01	0.685
HF	P03-03	3503.612	2.78E 01	0.000
HF	P03-04	3461.440	2.65E 01	0.000
HF	P03-05	3417.996	8.27E-01	0.437
HF	P03-06	3373.334	7.08E-02	0.932
HF	P03-07	3327.508	7.35E 00	0.001
HF	P03-08	3280.570	1.16E 00	0.313
HF	P03-09	3232.574	1.83E 00	0.160
HF	P03-10	3183.575	2.26E-01	0.798
HF	P03-11	3133.624	3.13E 00	0.044

## 2 km ALTITUDE

5.260 TORR 1:20 (IN 602 TORR AT 12.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	5.00E 00	0.007
HF	P03-13	3031.083	3.72E 00	0.024
HF	P04-03	3344.946	5.41E-02	0.947
HF	P04-04	3304.335	1.67E-01	0.846
HF	P04-05	3262.474	1.14E 00	0.318
HF	P04-06	3219.420	7.01E 01	0.000
HF	P04-07	3175.228	2.98E-01	0.742
HF	P04-08	3129.951	1.61E-01	0.852
HF	P04-09	3083.640	2.80E-01	0.756
HF	P04-10	3036.351	4.22E-01	0.656
HF	P04-11	2988.124	5.50E-01	0.577
HF	P04-12	2939.006	2.72E-02	0.973
HF	P04-13	2689.039	7.76E-03	0.992
HF	P05-03	3189.783	8.67E-02	0.917
HF	P05-04	3150.685	8.27E-02	0.921
HF	P05-05	3110.367	5.79E 00	0.003
HF	P05-06	3068.880	2.47E-01	0.781
HF	P05-07	3026.272	8.55E-01	0.425
HF	P05-08	2982.592	2.60E-01	0.771
HF	P05-09	2937.889	2.09E-01	0.811
HF	P06-04	2999.911	3.25E-02	0.968
HF	P06-05	2961.081	2.16E-01	0.806
HF	P06-06	2921.320	4.21E-02	0.959
HF	P06-07	2880.451	9.95E-03	0.990
HF	P06-08	2838.307	5.00E-02	0.951
HF	P06-09	2794.710	1.03E-02	0.990
HF	P06-10	2749.487	1.63E-02	0.984

## 3 km ALTITUDE

3.507 TORR H<sub>2</sub>O (IN 533 TORR AT 6.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	7.77E 00	0.000
HF	P01-03	3833.810	2.36E 01	0.000
HF	P01-04	3788.370	2.66E 00	0.070
HF	P01-05	3741.600	6.89E 01	0.000
HF	P01-06	3693.413	3.47E 01	0.000
HF	P01-07	3644.143	8.05E 00	0.000
HF	P01-08	3593.706	1.96E 01	0.000
HF	P01-09	3542.159	1.79E 00	0.167
HF	P01-10	3489.560	4.27E-01	0.653
HF	P01-11	3435.965	2.03E 00	0.131
HF	P01-12	3381.432	8.81E-02	0.916
HF	P01-13	3326.018	5.03E 00	0.007
HF	P01-14	3269.781	1.42E-01	0.868
HF	P01-15	3212.778	3.14E-01	0.731
HF	P02-02	3708.783	6.14E 01	0.000
HF	P02-03	3666.356	7.66E 00	0.000
HF	P02-04	3622.577	4.61E 01	0.000
HF	P02-05	3577.497	1.38E 01	0.000
HF	P02-06	3531.170	7.72E 00	0.000
HF	P02-07	3483.652	1.04E 00	0.354
HF	P02-08	3434.995	1.29E-01	0.879
HF	P02-09	3385.256	1.55E 00	0.212
HF	P02-10	3334.490	4.45E 00	0.012
HF	P02-11	3282.754	1.14E 00	0.321
HF	P02-12	3230.101	3.82E 00	0.022
HF	P02-13	3176.588	2.36E-01	0.790
HF	P03-03	3503.612	1.69E 01	0.000
HF	P03-04	3461.440	1.68E 01	0.000
HF	P03-05	3417.996	4.89E-01	0.613
HF	P03-06	3373.334	4.08E-02	0.960
HF	P03-07	3327.508	4.43E 00	0.012
HF	P03-08	3280.570	7.22E-01	0.486
HF	P03-09	3232.574	1.13E 00	0.322
HF	P03-10	3183.575	1.40E-01	0.870
HF	P03-11	3133.624	1.95E 00	0.142

## 3 km ALTITUDE

3.507 TORR H<sub>2</sub>O (IN 533 TORR AT 6.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.775	3.09E 00	0.046
HF	P03-13	3031.083	2.26E 00	0.105
HF	P04-03	3344.946	3.04E-02	0.970
HF	P04-04	3304.335	9.95E-02	0.905
HF	P04-05	3262.474	7.44E-01	0.475
HF	P04-06	3219.420	5.18E 01	0.000
HF	P04-07	3175.223	1.88E-01	0.829
HF	P04-08	3129.951	9.86E-02	0.906
HF	P04-09	3083.640	1.71E-01	0.843
HF	P04-10	3036.351	2.52E-01	0.777
HF	P04-11	2988.124	3.23E-01	0.724
HF	P04-12	2939.006	1.91E-02	0.981
HF	P04-13	2889.039	5.49E-03	0.995
HF	P05-03	3189.783	5.26E-02	0.949
HF	P05-04	3150.685	4.99E-02	0.951
HF	P05-05	3110.367	3.86E 00	0.021
HF	P05-06	3068.886	1.58E-01	0.854
HF	P05-07	3026.272	5.25E-01	0.592
HF	P05-08	2982.592	1.54E-01	0.857
HF	P05-09	2937.889	1.62E-01	0.851
HF	P06-04	2999.911	2.05E-02	0.980
HF	P06-05	2961.081	1.24E-01	0.883
HF	P06-06	2921.320	3.57E-02	0.967
HF	P06-07	2880.451	6.78E-03	0.993
HF	P06-08	2838.307	3.07E-02	0.970
HF	P06-09	2794.710	7.95E-03	0.992
HF	P06-10	2749.487	1.50E-02	0.985

## 4 km ALTITUDE

2.290 TORR H<sub>2</sub>O (IN 471 TORR AT 0.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	4.84E 00	0.008
HF	P01-03	3833.810	1.42E 01	0.000
HF	P01-04	3788.370	1.70E 00	0.183
HF	P01-05	3741.600	4.12E 01	0.000
HF	P01-06	3693.413	2.21E 01	0.000
HF	P01-07	3644.143	5.11E 00	0.006
HF	P01-08	3593.706	1.16E 01	0.000
HF	P01-09	3542.159	1.05E 00	0.352
HF	P01-10	3489.560	2.44E-01	0.783
HF	P01-11	3435.965	1.24E 00	0.289
HF	P01-12	3381.432	4.99E-02	0.951
HF	P01-13	3326.018	3.26E 00	0.039
HF	P01-14	3269.781	8.21E-02	0.921
HF	P01-15	3212.778	1.92E-01	0.826
HF	P02-02	3708.783	3.81E 01	0.000
HF	P02-03	3666.356	4.56E 00	0.010
HF	P02-04	3622.577	3.74E 01	0.000
HF	P02-05	3577.497	8.81E 00	0.000
HF	P02-06	3531.170	4.35E 00	0.013
HF	P02-07	3483.652	5.92E-01	0.553
HF	P02-08	3434.995	7.40E-02	0.929
HF	P02-09	3385.256	9.12E-01	0.402
HF	P02-10	3334.490	2.47E 00	0.084
HF	P02-11	3282.754	6.71E-01	0.511
HF	P02-12	3230.101	2.37E 00	0.093
HF	P02-13	3176.588	1.44E-01	0.866
HF	P03-03	3503.612	1.01E 01	0.000
HF	P03-04	3461.440	1.04E 01	0.000
HF	P03-05	3417.996	2.83E-01	0.753
HF	P03-06	3373.334	2.30E-02	0.977
HF	P03-07	3327.508	2.58E 00	0.076
HF	P03-08	3280.570	4.39E-01	0.645
HF	P03-09	3232.574	6.89E-01	0.502
HF	P03-10	3183.575	8.48E-02	0.919
HF	P03-11	3133.624	1.19E 00	0.303

## 4 km ALTITUDE

2.290 TORR H<sub>2</sub>O (IN 471 TORR AT 0.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	1.85E 00	0.157
HF	P03-13	3031.083	1.34E 00	0.261
HF	P04-03	3344.946	1.67E-02	0.983
HF	P04-04	3304.335	5.81E-02	0.944
HF	P04-05	3262.474	4.68E-01	0.626
HF	P04-06	3219.420	3.72E 01	0.000
HF	P04-07	3175.228	1.17E-01	0.890
HF	P04-08	3129.951	5.96E-02	0.942
HF	P04-09	3083.640	1.03E-01	0.902
HF	P04-10	3036.351	1.48E-01	0.862
HF	P04-11	2988.124	1.97E-01	0.829
HF	P04-12	2939.006	1.35E-02	0.987
HF	P04-13	2889.039	3.95E-03	0.996
HF	P05-03	3189.783	3.11E-02	0.969
HF	P05-04	3150.685	2.96E-02	0.971
HF	P05-05	3110.367	2.49E 00	0.083
HF	P05-06	3068.880	9.94E-02	0.905
HF	P05-07	3026.272	3.16E-01	0.729
HF	P05-08	2982.592	9.07E-02	0.913
HF	P05-09	2937.889	1.26E-01	0.882
HF	P06-04	2999.911	1.30E-02	0.987
HF	P06-05	2961.081	7.03E-02	0.932
HF	P06-06	2921.320	2.78E-02	0.973
HF	P06-07	2880.451	4.72E-03	0.995
HF	P06-08	2838.307	1.84E-02	0.982
HF	P06-09	2794.710	6.18E-03	0.994
HF	P06-10	2749.487	1.39E-02	0.986

## 5 km ALTITUDE

1.383 TORR H<sub>2</sub>O (IN 416 TORR AT -6.0 DEG C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km <sup>2</sup> )	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	2.80E 00	0.061
HF	P01-03	3833.810	7.93E 00	0.000
HF	P01-04	3788.370	1.01E 00	0.364
HF	P01-05	3741.600	2.29E 01	0.000
HF	P01-06	3693.413	1.31E 01	0.000
HF	P01-07	3644.143	3.10E 00	0.045
HF	P01-08	3593.706	6.39E 00	0.002
HF	P01-09	3542.159	5.69E-01	0.566
HF	P01-10	3489.560	1.30E-01	0.878
HF	P01-11	3435.965	6.93E-01	0.500
HF	P01-12	3381.432	2.61E-02	0.974
HF	P01-13	3326.018	1.93E 00	0.145
HF	P01-14	3269.781	4.38E-02	0.957
HF	P01-15	3212.778	1.08E-01	0.897
HF	P02-02	3708.783	2.20E 01	0.000
HF	P02-03	3666.356	2.51E 00	0.081
HF	P02-04	3622.577	3.02E 01	0.000
HF	P02-05	3577.497	5.42E 00	0.004
HF	P02-06	3531.170	2.26E 00	0.104
HF	P02-07	3483.652	3.13E-01	0.731
HF	P02-08	3434.995	3.91E-02	0.962
HF	P02-09	3385.256	4.95E-01	0.610
HF	P02-10	3334.490	1.26E 00	0.284
HF	P02-11	3282.754	3.66E-01	0.694
HF	P02-12	3230.101	1.36E 00	0.258
HF	P02-13	3176.588	8.09E-02	0.922
HF	P03-03	3503.612	5.54E 00	0.004
HF	P03-04	3461.440	5.91E 00	0.003
HF	P03-05	3417.996	1.51E-01	0.860
HF	P03-06	3373.334	1.20E-02	0.988
HF	P03-07	3327.508	1.38E 00	0.253
HF	P03-08	3280.570	2.46E-01	0.782
HF	P03-09	3232.574	3.86E-01	0.680
HF	P03-10	3183.575	4.77E-02	0.953
HF	P03-11	3133.624	6.70E-01	0.512

## 5 km ALTITUDE

1.383 TORR H<sub>2</sub>O (IN 416 TORR AT -6.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	1.02E 00	0.360
HF	P03-13	3031.083	7.37E-01	0.478
HF	P04-03	3344.946	8.57E-03	0.991
HF	P04-04	3304.335	3.13E-02	0.969
HF	P04-05	3262.474	2.68E-01	0.765
HF	P04-06	3219.420	2.44E 01	0.000
HF	P04-07	3175.228	6.89E-02	0.933
HF	P04-08	3129.951	3.35E-02	0.967
HF	P04-09	3083.640	5.80E-02	0.944
HF	P04-10	3036.351	8.02E-02	0.923
HF	P04-11	2988.124	1.02E-01	0.903
HF	P04-12	2939.006	9.37E-03	0.991
HF	P04-13	2889.039	2.84E-03	0.997
HF	P05-03	3189.783	1.69E-02	0.983
HF	P05-04	3150.685	1.64E-02	0.984
HF	P05-05	3110.367	1.46E 00	0.232
HF	P05-06	3068.880	5.87E-02	0.943
HF	P05-07	3026.272	1.76E-01	0.839
HF	P05-08	2982.592	5.09E-02	0.950
HF	P05-09	2937.889	9.75E-02	0.907
HF	P06-04	2999.911	8.14E-03	0.992
HF	P06-05	2961.081	3.69E-02	0.964
HF	P06-06	2921.320	2.33E-02	0.977
HF	P06-07	2880.451	3.28E-03	0.997
HF	P06-08	2838.307	1.01E-02	0.990
HF	P06-09	2794.710	4.78E-03	0.995
HF	P06-10	2719.487	1.30E-02	0.987

## 6 km ALTITUDE

0.816 TORR H<sub>2</sub>O (IN 365 TORR AT -12.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	1.59E 00	0.205
HF	P01-03	3833.810	4.31E 00	0.013
HF	P01-04	3788.370	5.89E-01	0.555
HF	P01-05	3741.600	1.24E 01	0.000
HF	P01-06	3693.413	7.57E 00	0.001
HF	P01-07	3644.143	1.88E 00	0.152
HF	P01-08	3593.706	3.50E 00	0.030
HF	P01-09	3542.159	3.04E-01	0.738
HF	P01-10	3489.560	6.85E-02	0.934
HF	P01-11	3435.965	3.73E-01	0.689
HF	P01-12	3381.432	1.33E-02	0.987
HF	P01-13	3326.018	1.10E 00	0.332
HF	P01-14	3269.781	2.28E-02	0.977
HF	P01-15	3212.778	5.97E-02	0.942
HF	P02-02	3708.783	1.26E 01	0.000
HF	P02-03	3666.356	1.36E 00	0.257
HF	P02-04	3622.577	2.44E 01	0.000
HF	P02-05	3577.497	3.38E 00	0.034
HF	P02-06	3531.170	1.15E 00	0.318
HF	P02-07	3483.652	1.62E-01	0.850
HF	P02-08	3434.995	2.01E-02	0.980
HF	P02-09	3385.256	2.62E-01	0.770
HF	P02-10	3334.490	6.20E-01	0.538
HF	P02-11	3282.754	1.94E-01	0.823
HF	P02-12	3230.101	7.55E-01	0.470
HF	P02-13	3176.588	4.45E-02	0.956
HF	P03-03	3503.612	2.97E 00	0.051
HF	P03-04	3461.440	3.25E 00	0.039
HF	P03-05	3417.996	7.86E-02	0.924
HF	P03-06	3373.334	6.15E-03	0.994
HF	P03-07	3327.508	7.08E-01	0.493
HF	P03-08	3280.570	1.34E-01	0.874
HF	P03-09	3232.574	2.11E-01	0.810
HF	P03-10	3183.575	2.62E-02	0.974
HF	P03-11	3133.624	3.66E-01	0.693

## 6 km ALTITUDE

0.816 TORR H<sub>2</sub>O (IN 365 TORR AT -12.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	5.48E-01	0.578
HF	P03-13	3031.083	3.95E-01	0.674
HF	P04-03	3544.946	4.34E-03	0.996
HF	P04-04	3304.335	1.64E-02	0.984
HF	P04-05	3262.474	1.48E-01	0.862
HF	P04-06	3219.420	1.55E-01	0.000
HF	P04-07	3175.228	4.04E-02	0.960
HF	P04-08	3129.951	1.85E-02	0.982
HF	P04-09	3083.640	3.23E-02	0.968
HF	P04-10	3036.351	4.25E-02	0.958
HF	P04-11	2988.124	5.54E-02	0.946
HF	P04-12	2939.006	6.62E-03	0.993
HF	P04-13	2889.039	2.09E-03	0.998
HF	P05-03	3189.783	8.93E-03	0.991
HF	P05-04	3150.685	9.04E-03	0.991
HF	P05-05	3110.367	8.26E-01	0.438
HF	P05-06	3068.880	3.43E-02	0.966
HF	P05-07	3026.272	9.53E-02	0.909
HF	P05-08	2982.592	2.91E-02	0.971
HF	P05-09	2937.889	7.55E-02	0.927
HF	P06-04	2999.911	5.23E-03	0.995
HF	P06-05	2961.081	1.92E-02	0.981
HF	P06-06	2921.320	2.02E-02	0.980
HF	P06-07	2880.451	2.36E-03	0.998
HF	P06-08	2838.307	5.45E-03	0.995
HF	P06-09	2794.710	3.71E-03	0.996
HF	P06-10	2749.487	1.22E-02	0.988

## 7 km ALTITUDE

0.470 TORR H<sub>2</sub>O (IN 320 TORR AT -18.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	8.76E-01	0.416
HF	P01-03	3833.810	2.28E 00	0.102
HF	P01-04	3788.370	3.36E-01	0.715
HF	P01-05	3741.600	6.63E 00	0.001
HF	P01-06	3693.413	4.29E 00	0.014
HF	P01-07	3644.143	1.15E 00	0.317
HF	P01-08	3593.706	1.91E 00	0.147
HF	P01-09	3542.159	1.61E-01	0.852
HF	P01-10	3489.560	3.58E-02	0.965
HF	P01-11	3435.965	1.94E-01	0.824
HF	P01-12	3381.432	6.62E-03	0.993
HF	P01-13	3326.018	6.05E-01	0.546
HF	P01-14	3269.781	1.15E-02	0.989
HF	P01-15	3212.778	3.20E-02	0.968
HF	P02-02	3708.783	7.14E 00	0.001
HF	P02-03	3666.356	7.17E-01	0.488
HF	P02-04	3622.577	1.95E 01	0.000
HF	P02-05	3577.497	2.15E 00	0.117
HF	P02-06	3531.170	5.67E-01	0.567
HF	P02-07	3483.652	8.23E-02	0.921
HF	P02-08	3434.995	1.01E-02	0.990
HF	P02-09	3385.256	1.35E-01	0.874
HF	P02-10	3334.490	2.95E-01	0.745
HF	P02-11	3282.754	1.00E-01	0.905
HF	P02-12	3230.101	4.08E-01	0.665
HF	P02-13	3176.588	2.39E-02	0.976
HF	P03-03	3503.612	1.55E 00	0.213
HF	P03-04	3461.440	1.73E 00	0.177
HF	P03-05	3417.996	3.97E-02	0.961
HF	P03-06	3373.334	3.08E-03	0.997
HF	P03-07	3327.508	3.52E-01	0.703
HF	P03-08	3280.570	7.12E-02	0.931
HF	P03-09	3232.574	1.12E-01	0.891
HF	P03-10	3183.575	1.41E-02	0.986
HF	P03-11	3133.624	1.94E-01	0.823

## 7 km ALTITUDE

0.170 TORR H<sub>2</sub>O (IN 320 TORR AT -18.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	2.85E-01	0.752
HF	P03-13	3031.083	2.05E-01	0.814
HF	P04-03	3344.946	2.19E-03	0.998
HF	P04-04	3304.335	8.36E-03	0.992
HF	P04-05	3262.474	7.83E-02	0.925
HF	P04-06	3219.420	9.49E-00	0.000
HF	P04-07	3175.228	2.37E-02	0.977
HF	P04-08	3129.951	9.99E-03	0.990
HF	P04-09	3083.640	1.79E-02	0.982
HF	P04-10	3036.351	2.19E-02	0.978
HF	P04-11	2988.124	3.04E-02	0.970
HF	P04-12	2939.006	4.72E-03	0.995
HF	P04-13	2889.039	1.56E-03	0.998
HF	P05-03	3189.783	4.58E-03	0.995
HF	P05-04	3150.685	4.94E-03	0.995
HF	P05-05	3110.367	4.50E-01	0.638
HF	P05-06	3068.880	1.99E-02	0.980
HF	P05-07	3026.272	5.05E-02	0.951
HF	P05-08	2982.592	1.72E-02	0.983
HF	P05-09	2937.889	5.81E-02	0.944
HF	P05-04	2999.911	3.47E-03	0.997
HF	P06-05	2961.081	9.93E-03	0.990
HF	P06-06	2921.320	1.79E-02	0.982
HF	P06-07	2880.451	1.74E-03	0.998
HF	P06-08	2838.307	2.84E-03	0.997
HF	P06-09	2794.710	2.88E-03	0.997
HF	P06-10	2749.487	1.14E-02	0.989

## 8 km ALTITUDE

0.238 TORR H<sub>2</sub>O (IN 279 TORR AT -25.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	4.27E-01	0.652
HF	P01-03	3833.810	1.07E 00	0.342
HF	P01-04	3788.370	1.69E-01	0.844
HF	P01-05	3741.600	3.19E 00	0.041
HF	P01-06	3693.413	2.21E 00	0.109
HF	P01-07	3644.143	6.74E-01	0.510
HF	P01-08	3593.706	9.91E-01	0.371
HF	P01-09	3542.159	7.75E-02	0.925
HF	P01-10	3489.560	1.73E-02	0.983
HF	P01-11	3435.965	8.39E-02	0.920
HF	P01-12	3381.432	2.90E-03	0.997
HF	P01-13	3326.018	2.83E-01	0.754
HF	P01-14	3269.781	5.13E-03	0.995
HF	P01-15	3212.778	1.53E-02	0.985
HF	P02-02	3708.783	3.79E 00	0.023
HF	P02-03	3666.356	3.40E-01	0.712
HF	P02-04	3622.577	1.57E 01	0.000
HF	P02-05	3577.497	1.36E 00	0.256
HF	P02-06	3531.170	2.49E-01	0.780
HF	P02-07	3483.652	3.72E-02	0.963
HF	P02-08	3434.995	4.49E-03	0.996
HF	P02-09	3385.256	6.11E-02	0.941
HF	P02-10	3334.490	1.21E-01	0.886
HF	P02-11	3282.754	4.55E-02	0.956
HF	P02-12	3230.101	1.96E-01	0.822
HF	P02-13	3176.588	1.14E-02	0.989
HF	P03-03	3503.612	7.11E-01	0.491
HF	P03-04	3461.440	8.11E-01	0.445
HF	P03-05	3417.996	1.76E-02	0.983
HF	P03-06	3373.334	1.38E-03	0.999
HF	P03-07	3327.508	1.51E-01	0.860
HF	P03-08	3280.570	3.34E-02	0.967
HF	P03-09	3232.574	5.24E-02	0.949
HF	P03-10	3183.575	6.77E-03	0.993
HF	P03-11	3133.624	9.10E-02	0.913

**8 km ALTITUDE**  
**0.238 TORR H<sub>2</sub>O (IN 279 TORR AT -25.0 DEG. C.) (Cont'd)**

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	1.30E-01	0.878
HF	P03-13	3031.083	9.43E-02	0.910
HF	P04-03	3344.946	1.02E-03	0.999
HF	P04-04	3304.335	3.75E-03	0.996
HF	P04-05	3262.474	3.55E-02	0.965
HF	P04-06	3219.420	5.06E-00	0.006
HF	P04-07	3175.228	1.30E-02	0.987
HF	P04-08	3129.951	4.90E-03	0.995
HF	P04-09	3083.640	9.29E-03	0.991
HF	P04-10	3036.351	1.01E-02	0.990
HF	P04-11	2988.124	1.60E-02	0.984
HF	P04-12	2939.005	3.37E-03	0.997
HF	P04-13	2889.039	1.16E-03	0.999
HF	P05-03	3189.783	2.06E-03	0.998
HF	P05-04	3150.685	2.53E-03	0.997
HF	P05-05	3110.367	2.11E-01	0.809
HF	P05-06	3068.880	1.08E-02	0.989
HF	P05-07	3026.272	2.38E-02	0.976
HF	P05-08	2982.592	1.01E-02	0.990
HF	P05-09	2937.889	4.45E-02	0.956
HF	P06-04	2999.911	2.34E-03	0.998
HF	P06-05	2961.081	4.80E-03	0.995
HF	P06-06	2921.320	1.60E-02	0.984
HF	P06-07	2880.451	1.30E-03	0.999
HF	P06-08	2838.307	1.32E-03	0.999
HF	P06-09	2794.710	2.22E-03	0.998
HF	P06-10	2749.487	1.05E-02	0.990

## 9 km ALTITUDE

0.130 TORR H<sub>2</sub>O (IN 243 TORR AT -31.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	2.23E-01	0.800
HF	P01-03	3833.810	5.39E-01	0.583
HF	P01-04	3788.370	9.12E-02	0.913
HF	P01-05	3741.600	1.66E 00	0.189
HF	P01-06	3693.413	1.23E 00	0.292
HF	P01-07	3644.143	4.22E-01	0.656
HF	P01-08	3593.706	5.69E-01	0.566
HF	P01-09	3542.159	4.10E-02	0.960
HF	P01-10	3489.560	9.41E-03	0.991
HF	P01-11	3435.965	3.97E-02	0.961
HF	P01-12	3381.432	1.38E-03	0.999
HF	P01-13	3326.018	1.42E-01	0.868
HF	P01-14	3269.781	2.46E-03	0.998
HF	P01-15	3212.778	7.81E-03	0.992
HF	P02-02	3708.783	2.19E 00	0.112
HF	P02-03	3666.356	1.74E-01	0.841
HF	P02-04	3622.577	1.25E 01	0.000
HF	P02-05	3577.497	9.43E-01	0.389
HF	P02-06	3531.170	1.21E-01	0.886
HF	P02-07	3483.652	1.83E-02	0.982
HF	P02-08	3434.995	2.20E-03	0.998
HF	P02-09	3385.256	2.98E-02	0.971
HF	P02-10	3334.490	5.38E-02	0.948
HF	P02-11	3282.754	2.22E-02	0.978
HF	P02-12	3230.101	1.00E-01	0.905
HF	P02-13	3176.588	5.81E-03	0.994
HF	P03-03	303.612	3.51E-01	0.704
HF	P03-04	3461.440	4.05E-01	0.667
HF	P03-05	3417.996	8.43E-03	0.992
HF	P03-06	3373.334	6.74E-04	0.999
HF	P03-07	3327.508	6.96E-02	0.933
HF	P03-08	3280.570	1.68E-02	0.983
HF	P03-09	3232.574	2.63E-02	0.974
HF	P03-10	3183.575	3.49E-03	0.997
HF	P03-11	3133.624	4.57E-02	0.955

## 9 km ALTITUDE

0.130 TORR H<sub>2</sub>O (IN 243 TORR AT -31.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	6.35E-02	0.938
HF	P03-13	3031.083	4.65E-02	0.955
HF	P04-03	3344.946	5.47E-04	0.999
HF	P04-04	3304.335	1.81E-03	0.998
HF	P04-05	3262.474	1.73E-02	0.983
HF	P04-06	3219.420	2.86E-00	0.058
HF	P04-07	3175.228	7.74E-03	0.992
HF	P04-08	3129.951	2.60E-03	0.997
HF	P04-09	3083.640	5.33E-03	0.995
HF	P04-10	3036.351	5.04E-03	0.995
HF	P04-11	2988.124	9.55E-03	0.990
HF	P04-12	2939.006	2.47E-03	0.998
HF	P04-13	2889.039	8.97E-04	0.999
HF	P05-03	3189.783	1.00E-03	0.999
HF	P05-04	3150.685	1.44E-03	0.999
HF	P05-05	3110.367	1.06E-01	0.899
HF	P05-06	3068.880	6.39E-03	0.994
HF	P05-07	3026.272	1.21E-02	0.988
HF	P05-08	2982.592	6.76E-03	0.993
HF	P05-09	2937.889	3.41E-02	0.966
HF	P06-04	2999.911	1.68E-03	0.998
HF	P06-05	2961.081	2.63E-03	0.997
HF	P06-06	2921.320	1.45E-02	0.986
HF	P06-07	2880.451	1.00E-03	0.999
HF	P06-08	2838.307	6.58E-04	0.999
HF	P06-09	2794.710	1.72E-03	0.998
HF	P06-10	2749.487	9.69E-03	0.990

10 km ALTITUDE  
0.060 TORR H<sub>2</sub>O (IN 211 TORR AT -38.0 DEG. C.)

LASER	LINES	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	9.90E-02	0.906
HF	P01-03	3833.810	2.33E-01	0.792
HF	P01-04	3788.370	4.20E-02	0.959
HF	P01-05	3741.600	7.85E-01	0.456
HF	P01-06	3693.413	6.27E-01	0.534
HF	P01-07	3644.143	2.55E-01	0.775
HF	P01-08	3593.70b	3.22E-01	0.725
HF	P01-09	3542.159	2.02E-02	0.980
HF	P01-10	3489.560	4.96E-03	0.995
HF	P01-11	3435.965	1.51E-02	0.985
HF	P01-12	3381.432	5.70E-04	0.999
HF	P01-13	3326.018	5.83E-02	0.943
HF	P01-14	3269.781	1.00E-03	0.999
HF	P01-15	3212.778	3.43E-03	0.997
HF	P02-02	3708.783	1.22E 00	0.295
HF	P02-03	3666.356	7.85E-02	0.924
HF	P02-04	3622.577	9.85E 00	0.000
HF	P02-05	3577.497	6.64E-01	0.515
HF	P02-06	3531.170	5.27E-02	0.949
HF	P02-07	3483.652	8.03E-03	0.992
HF	P02-08	3434.995	9.81E-04	0.999
HF	P02-09	3385.256	1.24E-02	0.988
HF	P02-10	3334.490	1.98E-02	0.980
HF	P02-11	3282.754	9.21E-03	0.991
HF	P02-12	3230.101	4.39E-02	0.957
HF	P02-13	3176.588	2.55E-03	0.997
HF	P03-03	3503.612	1.49E-01	0.662
HF	P03-04	3461.440	1.73E-01	0.841
HF	P03-05	3417.996	3.42E-03	0.997
HF	P03-06	3373.334	2.97E-04	1.000
HF	P03-07	3327.508	2.69E-02	0.974
HF	P03-08	3280.570	7.21E-03	0.993
HF	P03-09	3232.574	1.12E-02	0.989
HF	P03-10	3183.575	1.57E-03	0.998
HF	P03-11	3133.624	1.96E-02	0.981

10 km ALTITUDE  
0.060 TORR H<sub>2</sub>O (IN 211 TORR AT -38.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	2.65E-02	0.974
HF	P03-13	3031.083	1.96E-02	0.981
HF	P04-03	3344.946	2.88E-04	1.000
HF	P04-04	3304.335	7.47E-04	0.999
HF	P04-05	3262.474	6.94E-03	0.993
HF	P04-06	3219.420	1.36E-00	0.257
HF	P04-07	3175.228	4.32E-03	0.996
HF	P04-08	3129.951	1.24E-03	0.999
HF	P04-09	3083.640	2.97E-03	0.997
HF	P04-10	3036.351	2.22E-03	0.998
HF	P04-11	2988.124	5.76E-03	0.994
HF	P04-12	2939.006	1.81E-03	0.998
HF	P04-13	2889.039	6.76E-04	0.999
HF	P05-03	3189.783	4.16E-04	1.000
HF	P05-04	3150.685	7.99E-04	0.999
HF	P05-05	3110.367	4.45E-02	0.956
HF	P05-06	3068.880	3.63E-03	0.996
HF	P05-07	3026.272	5.39E-03	0.995
HF	P05-08	2982.592	4.55E-03	0.995
HF	P05-09	2937.889	2.58E-02	0.975
HF	P06-04	2999.911	1.23E-03	0.999
HF	P06-05	2961.081	1.42E-03	0.999
HF	P06-06	2921.320	1.30E-02	0.987
HF	P06-07	2880.451	7.73E-04	0.999
HF	P06-08	2838.307	2.88E-04	1.000
HF	P06-09	2794.710	1.33E-03	0.999
HF	P06-10	2749.487	8.80E-03	0.991

11 km ALTITUDE  
0.031 TORR H<sub>2</sub>O (IN 182 TORR AT -44.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	4.72E-02	0.954
HF	P01-03	3833.810	1.08E-01	0.898
HF	P01-04	3788.370	2.06E-02	0.980
HF	P01-05	3741.600	4.09E-01	0.664
HF	P01-06	3693.413	3.50E-01	0.705
HF	P01-07	3644.143	1.63E-01	0.850
HF	P01-08	3593.706	2.03E-01	0.816
HF	P01-09	3542.159	1.11E-02	0.989
HF	P01-10	3489.560	2.98E-03	0.997
HF	P01-11	3435.965	6.36E-03	0.994
HF	P01-12	3381.432	2.61E-04	1.000
HF	P01-13	3326.018	2.58E-02	0.975
HF	P01-14	3269.781	4.40E-04	1.000
HF	P01-15	3212.778	1.61E-03	0.998
HF	P02-02	3708.783	7.53E-01	0.471
HF	P02-03	3666.356	3.89E-02	0.962
HF	P02-04	3622.577	7.70E-00	0.000
HF	P02-05	3577.497	5.00E-01	0.607
HF	P02-06	3531.170	2.67E-02	0.974
HF	P02-07	3483.652	3.93E-03	0.996
HF	P02-08	3434.995	5.19E-04	0.999
HF	P02-09	3385.256	5.56E-03	0.994
HF	P02-10	3334.490	7.96E-03	0.992
HF	P02-11	3282.754	4.12E-03	0.996
HF	P02-12	3230.101	2.06E-02	0.980
HF	P02-13	3176.588	1.20E-03	0.999
HF	P03-03	3503.612	6.80E-02	0.934
HF	P03-04	3461.440	7.93E-02	0.924
HF	P03-05	3417.996	1.50E-03	0.998
HF	P03-06	3373.334	1.48E-04	1.000
HF	P03-07	3327.508	1.13E-02	0.989
HF	P03-08	3280.570	3.32E-03	0.997
HF	P03-09	3232.574	5.15E-03	0.995
HF	P03-10	3183.575	7.61E-04	0.999
HF	P03-11	3133.524	9.08E-03	0.991

11 km ALTITUDE  
0.031 TORR H<sub>2</sub>O (IN 182 TORR AT -44.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	1.20E-02	0.988
HF	P03-13	3031.083	8.97E-03	0.991
HF	P04-03	3344.946	1.77E-04	1.000
HF	P04-04	3304.335	3.35E-04	1.000
HF	P04-05	3262.474	3.00E-03	0.997
HF	P04-06	3219.420	6.86E-01	0.504
HF	P04-07	3175.228	2.59E-03	0.997
HF	P04-08	3129.951	6.50E-04	0.999
HF	P04-09	3083.640	1.85E-03	0.998
HF	P04-10	3036.351	1.09E-03	0.999
HF	P04-11	2988.124	3.86E-03	0.996
HF	P04-12	2939.006	1.34E-03	0.999
HF	P04-13	2889.039	5.14E-04	0.999
HF	P05-03	3189.783	1.87E-04	1.000
HF	P05-04	3150.685	4.96E-04	1.000
HF	P05-05	3110.367	2.01E-02	0.980
HF	P05-06	3068.880	2.28E-03	0.998
HF	P05-07	3026.272	2.64E-03	0.997
HF	P05-08	2982.592	3.26E-03	0.997
HF	P05-09	2937.889	1.94E-02	0.981
HF	P06-04	2999.911	9.17E-04	0.999
HF	P06-05	2961.081	8.78E-04	0.999
HF	P06-06	2921.320	1.16E-02	0.988
HF	P06-07	2880.451	5.95E-04	0.999
HF	P06-08	2838.307	1.39E-04	1.000
HF	P06-09	2794.710	1.02E-03	0.999
HF	P06-10	2749.487	7.90E-03	0.992

## 12 km ALTITUDE

0.013 TORR H<sub>2</sub>O (IN 157 TORR AT -51.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	1.91E-02	0.981
HF	P01-03	3833.810	4.33E-02	0.958
HF	P01-04	3788.370	8.77E-03	0.991
HF	P01-05	3741.600	2.04E-01	0.815
HF	P01-06	3693.413	1.91E-01	0.826
HF	P01-07	3644.143	1.01E-01	0.904
HF	P01-08	3593.706	1.30E-01	0.878
HF	P01-09	3542.159	6.12E-03	0.994
HF	P01-10	3489.560	1.84E-03	0.998
HF	P01-11	3435.965	2.16E-03	0.998
HF	P01-12	3381.432	1.11E-04	1.000
HF	P01-13	3326.018	9.56E-03	0.990
HF	P01-14	3269.781	1.66E-04	1.000
HF	P01-15	3212.778	6.57E-04	0.999
HF	P02-02	3708.783	4.73E-01	0.623
HF	P02-03	3666.356	1.79E-02	0.982
HF	P02-04	3622.577	5.98E-00	0.003
HF	P02-05	3577.497	3.84E-01	0.681
HF	P02-06	3531.170	1.36E-02	0.986
HF	P02-07	3493.652	1.85E-03	0.998
HF	P02-08	3434.995	2.94E-04	1.000
HF	P02-09	3385.256	2.16E-03	0.998
HF	P02-10	3334.490	2.67E-03	0.997
HF	P02-11	3282.754	1.58E-03	0.998
HF	P02-12	3230.101	8.34E-03	0.992
HF	P02-13	3176.588	4.92E-04	1.000
HF	P03-03	3503.612	2.72E-02	0.973
HF	P03-04	3461.440	3.12E-02	0.969
HF	P03-05	3417.996	5.68E-04	0.999
HF	P03-06	3373.334	7.33E-05	1.000
HF	P03-07	3327.508	4.00E-03	0.996
HF	P03-08	3280.570	1.32E-03	0.999
HF	P03-09	3232.574	2.03E-03	0.998
HF	P03-10	3183.575	3.32E-04	1.000
HF	P03-11	3133.624	3.64E-03	0.996

## 12 km ALTITUDE

0.013 TORR H<sub>2</sub>O (IN 157 TORR AT -51.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	4.72E-03	0.995
HF	P03-13	3031.083	3.60E-03	0.996
HF	P04-03	3344.946	1.13E-04	1.000
HF	P04-04	3304.335	1.30E-04	1.000
HF	P04-05	3262.474	1.09E-03	0.999
HF	P04-06	3219.420	2.94E-01	0.745
HF	P04-07	3175.228	1.48E-03	0.999
HF	P04-08	3129.951	3.23E-04	1.000
HF	P04-09	3083.640	1.18E-03	0.999
HF	P04-10	3036.351	5.16E-04	0.999
HF	P04-11	2968.124	2.68E-03	0.997
HF	P04-12	2939.006	9.90E-04	0.999
HF	P04-13	2889.039	3.81E-04	1.000
HF	P05-03	3189.783	7.33E-05	1.000
HF	P05-04	3150.685	3.15E-04	1.000
HF	P05-05	3110.367	7.69E-03	0.992
HF	P05-06	3068.880	1.45E-03	0.999
HF	P05-07	3026.272	1.21E-03	0.999
HF	P05-08	2982.592	2.34E-03	0.998
HF	P05-09	2937.889	1.44E-02	0.986
HF	P06-04	2999.911	6.91E-04	0.999
HF	P06-05	2961.081	5.63E-04	0.999
HF	P06-06	2921.320	1.02E-02	0.990
HF	P06-07	2880.451	4.52E-04	1.000
HF	P06-08	2838.307	6.22E-05	1.000
HF	P06-09	2794.710	7.71E-04	0.999
HF	P06-10	2749.487	6.95E-03	0.993

13 km ALTITUDE  
0.006 TORR H<sub>2</sub>O (IN 134 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P01-02	3877.860	8.14E-03	0.992
HF	P01-03	3833.810	1.85E-02	0.982
HF	P01-04	3788.370	3.89E-03	0.996
HF	P01-05	3741.600	1.13E-01	0.893
HF	P01-06	3693.413	1.14E-01	0.892
HF	P01-07	3644.143	6.45E-02	0.938
HF	P01-08	3593.706	8.90E-02	0.915
HF	P01-09	3542.159	3.72E-03	0.996
HF	P01-10	3489.560	1.24E-03	0.999
HF	P01-11	3435.965	8.04E-04	0.999
HF	P01-12	3381.432	5.36E-05	1.000
HF	P01-13	3326.018	3.70E-03	0.996
HF	P01-14	3269.781	6.65E-05	1.000
HF	P01-15	3212.778	2.82E-04	1.000
HF	P02-02	3708.783	3.20E-01	0.726
HF	P02-03	3666.356	9.14E-03	0.991
HF	P02-04	3622.577	4.57E-00	0.010
HF	P02-05	3577.497	3.05E-01	0.337
HF	P02-06	3531.170	8.24E-03	0.992
HF	P02-07	3483.652	9.95E-04	0.999
HF	P02-08	3434.995	2.08E-04	1.000
HF	P02-09	3385.256	8.94E-04	0.999
HF	P02-10	3334.490	9.59E-04	0.999
HF	P02-11	3282.754	6.42E-04	0.999
HF	P02-12	3230.101	3.56E-03	0.996
HF	P02-13	3176.588	2.13E-04	1.000
HF	P03-03	3503.612	1.17E-02	0.988
HF	P03-04	3461.440	1.30E-02	0.987
HF	P03-05	3417.996	2.30E-04	1.000
HF	P03-06	3373.334	4.19E-05	1.000
HF	P03-07	3327.508	1.54E-03	0.998
HF	P03-08	3280.570	5.55E-04	0.999
HF	P03-09	3232.574	8.46E-04	0.999
HF	P03-10	3183.575	1.57E-04	1.000
HF	P03-11	3133.624	1.55E-03	0.998

## 13 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 134 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	2.92E-03	0.998
HF	P03-13	3031.083	1.57E-03	0.998
HF	P04-03	3344.946	7.84E-05	1.000
HF	P04-04	3304.335	5.50E-05	1.000
HF	P04-05	3262.474	4.18E-04	1.000
HF	P04-06	3219.420	1.34E-01	0.875
HF	P04-07	3175.228	8.85E-04	0.999
HF	P04-08	3129.951	1.76E-04	1.000
HF	P04-09	3083.640	8.01E-04	0.999
HF	P04-10	3036.351	2.80E-04	1.000
HF	P04-11	2988.124	1.94E-03	0.998
HF	P04-12	2939.006	7.35E-04	0.999
HF	P04-13	2889.039	2.81E-04	1.000
HF	P05-03	3189.783	3.11E-05	1.000
HF	P05-04	3150.685	2.14E-04	1.000
HF	P05-05	3110.367	3.14E-03	0.997
HF	P05-06	3068.880	9.91E-04	0.999
HF	P05-07	3026.272	6.32E-04	0.999
HF	P05-08	2982.592	1.71E-03	0.998
HF	P05-09	2937.889	1.05E-02	0.990
HF	P06-04	2999.911	5.21E-04	0.999
HF	P06-05	2961.081	3.87E-04	1.000
HF	P06-06	2921.320	8.83E-03	0.991
HF	P06-07	2880.451	3.40E-04	1.000
HF	P06-08	2838.307	3.13E-05	1.000
HF	P06-09	2794.710	5.81E-04	0.999
HF	P06-10	2749.487	6.00E-03	0.994

## 14 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 115 TORR AT -57.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 10 <sup>6</sup> M.
HF	P01-02	3877.860	7.43E-03	0.993
HF	P01-03	3833.810	1.58E-02	0.984
HF	P01-04	3788.370	3.51E-03	0.996
HF	P01-05	3741.600	8.73E-02	0.916
HF	P01-06	3693.413	8.78E-02	0.916
HF	P01-07	3644.143	4.84E-02	0.953
HF	P01-08	3593.706	6.60E-02	0.936
HF	P01-09	3542.159	2.82E-03	0.997
HF	P01-10	3489.560	9.39E-04	0.999
HF	P01-11	3435.965	7.94E-04	0.999
HF	P01-12	3381.432	4.29E-05	1.000
HF	P01-13	3326.018	3.46E-03	0.997
HF	P01-14	3269.781	5.68E-05	1.000
HF	P01-15	3212.778	2.41E-04	1.000
HF	P02-02	3708.783	2.40E-01	0.787
HF	P02-03	3666.356	7.35E-03	0.993
HF	P02-04	3622.577	3.38E-00	0.001
HF	P02-05	3577.497	2.54E-01	0.775
HF	P02-06	3531.170	6.95E-03	0.993
HF	P02-07	3483.652	7.91E-04	0.999
HF	P02-08	3434.995	1.88E-04	1.000
HF	P02-09	3385.256	7.60E-04	0.999
HF	P02-10	3334.490	8.20E-04	0.999
HF	P02-11	3282.754	5.50E-04	0.999
HF	P02-12	3230.101	3.06E-03	0.997
HF	P02-13	3176.588	1.81E-04	1.000
HF	P03-03	3503.612	9.85E-03	0.990
HF	P03-04	3461.440	1.11E-02	0.989
HF	P03-05	3417.996	1.95E-04	1.000
HF	P03-06	3373.334	3.23E-05	1.000
HF	P03-07	3327.508	1.31E-03	0.999
HF	P03-08	3280.570	4.75E-04	1.000
HF	P03-09	3232.574	7.30E-04	0.999
HF	P03-10	3183.575	1.29E-04	1.000
HF	P03-11	3133.624	1.32E-03	0.999

## 14 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 115 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
HF	P03-12	3082.776	1.70E-03	0.998
HF	P03-13	3031.083	1.32E-03	0.999
HF	P04-03	3344.946	5.99E-05	1.000
HF	P04-04	3304.335	4.70E-05	1.000
HF	P04-05	3262.474	3.69E-04	1.000
HF	P04-06	3219.420	1.22E-01	0.885
HF	P04-07	3175.228	6.84E-04	0.999
HF	P04-08	3129.951	1.38E-04	1.000
HF	P04-09	3083.640	5.98E-04	0.999
HF	P04-10	3036.351	2.22E-04	1.000
HF	P04-11	2988.124	1.44E-03	0.999
HF	P04-12	2939.006	5.61E-04	0.999
HF	P04-13	2889.039	2.21E-04	1.000
HF	P05-03	3189.783	2.63E-05	1.000
HF	P05-04	3150.685	1.61E-04	1.000
HF	P05-05	3110.367	2.75E-03	0.997
HF	P05-06	3068.880	7.45E-04	0.999
HF	P05-07	3026.272	5.22E-04	0.999
HF	P05-08	2982.592	1.28E-03	0.999
HF	P05-09	2937.889	7.77E-03	0.992
HF	P06-04	2999.911	3.83E-04	1.000
HF	P06-05	2961.081	2.87E-04	1.000
HF	P06-06	2921.320	7.59E-03	0.992
HF	P06-07	2880.451	2.56E-04	1.000
HF	P06-08	2838.307	2.51E-05	1.000
HF	P06-09	2794.710	4.47E-04	1.000
HF	P06-10	2749.487	5.14E-03	0.995

## 15 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 98 TORR AT -57.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
HF	P01-02	3877.860	6.68E-03	0.993
HF	P01-03	3833.810	1.34E-02	0.987
HF	P01-04	3788.370	3.13E-03	0.997
HF	P01-05	3741.600	6.73E-02	0.935
HF	P01-06	3693.413	6.74E-02	0.935
HF	P01-07	3644.143	3.61E-02	0.965
HF	P01-08	3593.706	4.85E-02	0.953
HF	P01-09	3542.159	2.12E-03	0.998
HF	P01-10	3489.560	7.07E-04	0.999
HF	P01-11	3435.965	7.70E-04	0.999
HF	P01-12	3381.432	3.43E-05	1.000
HF	P01-13	3326.018	3.17E-03	0.997
HF	P01-14	3269.781	4.83E-05	1.000
HF	P01-15	3212.778	2.04E-04	1.000
HF	P02-02	3708.783	1.79E-01	0.836
HF	P02-03	3666.356	5.87E-03	0.994
HF	P02-04	3622.577	2.46E-00	0.086
HF	P02-05	3577.497	2.07E-01	0.813
HF	P02-06	3531.170	5.75E-03	0.994
HF	P02-07	3483.652	6.26E-04	0.999
HF	P02-08	3434.995	1.67E-04	1.000
HF	P02-09	3385.256	6.42E-04	0.999
HF	P02-10	3334.490	6.97E-04	0.999
HF	P02-11	3282.754	4.68E-04	1.000
HF	P02-12	3230.101	2.60E-03	0.997
HF	P02-13	3176.588	1.53E-04	1.000
HF	P03-03	3503.612	8.25E-03	0.992
HF	P03-04	3461.440	9.47E-03	0.991
HF	P03-05	3417.996	1.64E-04	1.000
HF	P03-06	3373.334	2.49E-05	1.000
HF	P03-07	3327.508	1.12E-03	0.999
HF	P03-08	3280.570	4.04E-04	1.000
HF	P03-09	3232.574	6.26E-04	0.999
HF	P03-10	3183.575	1.06E-04	1.000
HF	P03-11	3133.624	1.12E-03	0.999

## 15 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 98 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
HF	P03-12	3082.776	1.42E-03	0.999
HF	P03-13	3031.083	1.11E-03	0.999
HF	P04-03	3344.946	4.51E-05	1.000
HF	P04-04	3304.335	3.98E-05	1.000
HF	P04-05	3262.474	3.21E-04	1.000
HF	P04-06	3219.420	1.09E-01	0.897
HF	P04-07	3175.228	5.21E-04	0.999
HF	P04-08	3129.951	1.07E-04	1.000
HF	P04-09	3083.640	4.43E-04	1.000
HF	P04-10	3036.351	1.76E-04	1.000
HF	P04-11	2988.124	1.06E-03	0.999
HF	P04-12	2939.006	4.28E-04	1.000
HF	P04-13	2889.039	1.71E-04	1.000
HF	P05-03	3189.783	2.21E-05	1.000
HF	P05-04	3150.685	1.20E-04	1.000
HF	P05-05	3110.367	2.37E-03	0.998
HF	P05-06	3068.880	5.57E-04	0.999
HF	P05-07	3026.272	4.31E-04	1.000
HF	P05-08	2982.592	9.38E-04	0.999
HF	P05-09	2937.889	5.65E-03	0.994
HF	P06-04	2999.911	2.78E-04	1.000
HF	P06-05	2961.081	2.10E-04	1.000
HF	P06-06	2921.320	6.36E-03	0.994
HF	P06-07	2880.451	1.89E-04	1.000
HF	P06-08	2838.307	2.00E-05	1.000
HF	P06-09	2794.710	3.40E-04	1.000
HF	P06-10	2749.487	4.29E-03	0.996

**Appendix D**  
**DF ABSORPTION TABLES**

0 km ALTITUDE

9.325 TORR H<sub>2</sub>O (IN 760 TORR AT 21.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P01-01	2884.943	1.06E-01	0.900
DF	P01-02	2862.647	2.66E-02	0.974
DF	P01-03	2839.786	3.77E-02	0.963
DF	P01-04	2816.376	3.44E-02	0.966
DF	P01-05	2792.432	5.50E-02	0.947
DF	P01-06	2767.967	5.57E-02	0.946
DF	PC1-07	2742.998	2.45E-02	0.976
DF	P01-08	2717.540	8.49E-02	0.919
DF	P01-09	2691.608	3.32E-02	0.967
DF	P01-10	2665.217	3.15E-02	0.969
DF	P01-11	2638.384	2.26E-01	0.798
DF	P01-12	2611.124	1.80E-02	0.932
DF	P01-13	2583.453	4.87E-02	0.952
DF	P01-14	2555.388	3.46E-02	0.966
DF	P01-15	2526.943	2.85E-02	0.972
DF	P01-16	2498.135	4.14E-02	0.959
DF	P01-17	2468.980	6.16E-02	0.940
DF	P02-02	2772.440	2.06E-01	0.814
DF	P02-03	2750.084	3.33E-02	0.967
DF	P02-04	2727.304	3.50E-02	0.966
DF	P02-05	2703.997	1.98E-02	0.980
DF	P02-06	2680.777	4.29E-02	0.958
DF	P02-07	2655.862	6.36E-02	0.938
DF	P02-08	2631.065	1.79E-02	0.982
DF	P02-09	2605.804	3.55E-02	0.965
DF	P02-10	2580.093	6.57E-02	0.936
DF	P02-11	2553.948	3.06E-02	0.970
DF	P02-12	2527.385	2.74E-02	0.973
DF	P02-13	2500.418	3.90E-02	0.962
DF	P02-14	2473.065	5.85E-02	0.943
DF	P02-15	2445.339	8.17E-02	0.922
DF	P02-16	2417.258	9.47E-02	0.910
DF	P03-02	2683.950	1.91E-02	0.981
DF	P03-03	2662.249	2.81E-02	0.972
DF	P03-04	2640.075	3.78E-02	0.963

## 0 km ALTITUDE

9.325 TORR H<sub>2</sub>O (IN 760 TORR AT 21.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P03-05	2617.384	1.62E-02	0.984
DF	P03-06	2594.193	2.49E-02	0.975
DF	P03-07	2570.516	5.68E-02	0.945
DF	P03-08	2546.367	4.94E-02	0.952
DF	P03-09	2521.763	2.82E-02	0.972
DF	P03-10	2496.718	4.27E-02	0.958
DF	P03-11	2471.247	7.91E-02	0.924
DF	P03-12	2445.365	8.32E-02	0.920
DF	P03-13	2419.086	9.36E-02	0.911
DF	P03-14	2392.427	1.71E-01	0.843
DF	P04-02	2597.220	2.79E-02	0.972
DF	P04-03	2576.160	2.98E-02	0.971
DF	P04-04	2554.548	4.13E-02	0.960
DF	P04-05	2532.465	2.69E-02	0.973
DF	P04-06	2509.887	3.35E-02	0.967
DF	P04-07	2486.837	4.73E-02	0.954
DF	P04-08	2463.334	7.15E-02	0.931
DF	P04-09	2439.390	8.56E-02	0.918
DF	P04-10	2414.990	9.58E-02	0.909
DF	P04-11	2390.170	4.27E-01	0.653
DF	P04-12	2364.950	4.65E-02	0.000
DF	P04-13	2339.340	9.57E-03	0.000
DF	P04-14	2313.350	4.98E-02	0.000
DF	P05-03	2491.620	4.80E-02	0.953
DF	P05-04	2470.630	5.93E-02	0.942
DF	P05-05	2449.140	8.49E-02	0.919
DF	P05-06	2427.170	8.32E-02	0.915
DF	P05-07	2404.730	1.06E-01	0.900
DF	P05-08	2381.830	4.04E-01	0.000
DF	P05-09	2358.490	1.26E-03	0.000
DF	P05-10	2334.730	2.54E-02	0.000
DF	P05-11	2310.550	2.36E-02	0.000
DF	P05-12	2285.970	9.10E-03	0.000
DF	P05-13	2261.900	7.16E-03	0.001
DF	P05-14	2235.670	1.30E-03	0.272

## 0 km ALTITUDE

9.325 TORR H<sub>2</sub>O (IN 760 TORR AT 21.0 DEC. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P06-05	2367.210	2.87E 02	0.000
DF	P06-06	2345.830	1.02E 03	0.000
DF	P06-07	2323.990	1.18E 02	0.000
DF	P06-08	2301.690	1.20E 02	0.000
DF	P06-09	2278.960	1.18E 01	0.000
DF	P06-10	2255.810	7.48E 00	0.001
DF	P06-11	2232.250	5.89E-01	0.555
DF	P06-12	2208.290	3.49E-01	0.705
DF	P06-13	2183.960	1.25E-01	0.882
DF	P06-14	2159.260	3.57E-02	0.965
DF	P07-05	2286.540	4.53E 00	0.011
DF	P07-06	2265.740	2.35E 00	0.095
DF	P07-07	2244.470	1.57E 00	0.208
DF	P07-08	2222.760	4.42E-01	0.643
DF	P07-09	2200.630	7.54E-01	0.471
DF	P07-10	2178.070	1.49E-01	0.862
DF	P07-11	2155.110	1.06E-01	0.900
DF	P07-12	2131.770	1.13E-01	0.893
DF	P08-04	2226.720	4.16E-01	0.660
DF	P08-05	2206.950	4.94E-01	0.610
DF	P08-06	2186.700	5.29E-01	0.589
DF	P08-07	2166.010	6.48E-02	0.937
DF	P08-08	2144.870	6.27E-01	0.534
DF	P08-09	2123.310	1.14E-01	0.892
DF	P08-10	2101.340	5.70E-02	0.945
DF	P08-11	2078.970	5.23E-01	0.593
DF	P08-12	2056.210	6.05E-02	0.941
DF	P09-04	2147.460	2.66E 00	0.070
DF	P09-05	2128.230	2.65E-02	0.974
DF	P09-06	2108.540	3.99E-02	0.961
DF	P09-07	2088.400	2.80E-01	0.756
DF	P09-08	2067.830	3.92E-01	0.676
DF	P09-09	2046.830	1.22E 06	0.296
DF	P09-10	2025.420	2.69E-01	0.764

## 1 km ALTITUDE

7.265 TORR H<sub>2</sub>O (IN 677 TORR AT 17.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P01-01	2884.943	8.97E-02	0.914
DF	P01-02	2862.647	2.01E-02	0.980
DF	P01-03	2839.786	3.19E-02	0.969
DF	P01-04	2816.376	2.62E-02	0.974
DF	P01-05	2792.432	4.10E-02	0.960
DF	P01-06	2767.967	4.11E-02	0.968
DF	P01-07	2742.998	1.84E-02	0.982
DF	P01-08	2717.540	6.17E-02	0.940
DF	P01-09	2691.608	2.64E-02	0.974
DF	P01-10	2665.217	2.37E-02	0.977
DF	P01-11	2638.384	1.66E-01	0.847
DF	P01-12	2611.124	1.33E-02	0.987
DF	P01-13	2583.453	4.07E-02	0.960
DF	P01-14	2555.388	2.73E-02	0.973
DF	P01-15	2526.943	2.23E-02	0.978
DF	P01-16	2498.135	3.23E-02	0.968
DF	P01-17	2468.980	4.85E-02	0.953
DF	P02-02	2772.440	1.56E-01	0.856
DF	P02-03	2750.084	2.48E-02	0.976
DF	P02-04	2727.304	2.60E-02	0.974
DF	P02-05	2703.997	1.46E-02	0.986
DF	P02-06	2680.177	3.13E-02	0.969
DF	P02-07	2655.862	4.63E-02	0.955
DF	P02-08	2631.065	1.34E-02	0.987
DF	P02-09	2605.804	2.58E-02	0.975
DF	P02-10	2580.093	5.79E-02	0.944
DF	P02-11	2553.948	2.40E-02	0.976
DF	P02-12	2527.385	2.13E-02	0.979
DF	P02-13	2500.418	3.05E-02	0.970
DF	P02-14	2473.065	4.62E-02	0.955
DF	P02-15	2445.339	6.47E-02	0.937
DF	P02-16	2417.258	7.51E-02	0.928
DF	P03-02	2683.950	1.45E-02	0.986
DF	P03-03	2662.249	2.05E-02	0.980
DF	P03-04	2640.075	2.91E-02	0.971
DF	P03-05	2617.384	1.21E-02	0.988
DF	P03-06	2594.193	1.84E-02	0.982
DF	P03-07	2570.516	4.86E-02	0.953
DF	P03-08	2546.367	4.04E-02	0.960
DF	P03-09	2521.763	2.18E-02	0.978

## 1 km ALTITUDE

7.265 TORR H<sub>2</sub>O (IN 677 TORR AT 17.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P03-10	2496.718	3.32E-02	0.967
DF	P03-11	2471.247	6.13E-02	0.941
DF	P03-12	2445.365	6.60E-02	0.936
DF	P03-13	2419.086	7.43E-02	0.928
DF	P03-14	2392.427	1.31E-01	0.877
DF	P04-02	2597.220	2.12E-02	0.979
DF	P04-03	2576.160	2.28E-02	0.977
DF	P04-04	2554.548	3.39E-02	0.967
DF	P04-05	2532.465	2.08E-02	0.979
DF	P04-06	2509.887	2.61E-02	0.974
DF	P04-07	2486.837	3.72E-02	0.963
DF	P04-08	2463.334	5.63E-02	0.945
DF	P04-09	2439.390	6.79E-02	0.934
DF	P04-10	2414.990	7.60E-02	0.927
DF	P04-11	2390.170	3.15E-01	0.730
DF	P04-12	2364.950	3.79E 02	0.000
DF	P04-13	2339.340	9.21E 03	0.000
DF	P04-14	2313.350	4.09E 02	0.000
DF	P05-03	2491.620	3.86E-02	0.962
DF	P05-04	2470.630	4.68E-02	0.954
DF	P05-05	2449.140	6.78E-02	0.934
DF	P05-06	2427.170	7.08E-02	0.932
DF	P05-07	2404.730	8.40E-02	0.919
DF	P05-08	2381.830	3.09E 01	0.000
DF	P05-09	2358.490	1.03E 03	0.000
DF	P05-10	2334.730	2.05E 02	0.000
DF	P05-11	2310.550	2.03E 02	0.000
DF	P05-12	2285.970	7.83E 00	0.000
DF	P05-13	2261.000	5.75E 00	0.003
DF	P05-14	2235.670	1.02E 00	0.360
DF	P06-05	2367.210	2.29E 02	0.000
DF	P06-06	2345.830	8.53E 02	0.000
DF	P06-07	2323.990	9.37E 01	0.000
DF	P06-08	2301.690	1.08E 02	0.000
DF	P06-09	2278.960	9.83E 00	0.000

## 1 km ALTITUDE

7.265 TORR H<sub>2</sub>O (IN 677 TORR AT 17.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P06-10	2255.810	6.02E 00	0.002
DF	P06-11	2232.250	4.76E-01	0.622
DF	P06-12	2208.290	2.79E-01	0.757
DF	P06-13	2183.960	9.97E-02	0.905
DF	P06-14	2159.260	2.68E-02	0.974
DF	P07-05	2286.540	3.48E 00	0.031
DF	P07-06	2265.740	1.89E 00	0.151
DF	P07-07	2244.470	1.34E 00	0.262
DF	P07-08	2222.760	3.96E-01	0.673
DF	P07-09	2200.630	6.23E-01	0.536
DF	P07-10	2178.070	1.23E-01	0.884
DF	P07-11	2155.110	7.49E-02	0.928
DF	P07-12	2131.770	8.45E-02	0.919
DF	P08-04	2226.720	3.28E-01	0.720
DF	P08-05	2206.950	3.91E-01	0.676
DF	P08-06	2185.700	3.94E-01	0.675
DF	P08-07	2166.010	4.79E-02	0.953
DF	P08-08	2144.870	4.59E-01	0.632
DF	P08-09	2123.310	8.07E-02	0.922
DF	P08-10	2101.340	4.03E-02	0.961
DF	P08-11	2078.970	3.57E-01	0.700
DF	P08-12	2056.210	4.32E-02	0.958
DF	P09-04	2147.460	1.99E 00	0.136
DF	P09-05	2128.230	1.91E-02	0.981
DF	P09-06	2108.540	2.80E-02	0.972
DF	P09-07	2088.400	1.86E-01	0.830
DF	P09-08	2067.830	2.82E-01	0.754
DF	P09-09	2046.830	8.40E-01	0.432
DF	P09-10	2025.420	1.82E-01	0.833

2 km ALTITUDE  
5.260 TORR H<sub>2</sub>O (IN 602 TORR AT 12.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	7.42E-02	0.929
DF	P01-02	2862.647	1.45E-02	0.986
DF	P01-03	2839.786	2.56E-02	0.975
DF	P01-04	2816.376	1.88E-02	0.981
DF	P01-05	2792.432	2.92E-02	0.971
DF	P01-06	2767.967	2.88E-02	0.972
DF	P01-07	2742.998	1.31E-02	0.987
DF	P01-08	2717.540	4.19E-02	0.959
DF	P01-09	2691.608	2.06E-02	0.980
DF	P01-10	2665.217	1.70E-02	0.983
DF	P01-11	2638.384	1.14E-01	0.892
DF	P01-12	2611.124	9.37E-03	0.991
DF	P01-13	2583.453	3.35E-02	0.967
DF	P01-14	2555.388	2.11E-02	0.979
DF	P01-15	2526.943	1.70E-02	0.983
DF	P01-16	2498.135	2.47E-02	0.976
DF	P01-17	2468.980	3.78E-02	0.963
DF	P02-02	2772.440	1.10E-01	0.896
DF	P02-03	2750.084	1.74E-02	0.983
DF	P02-04	2727.304	1.83E-02	0.982
DF	P02-05	2703.997	1.01E-02	0.990
DF	P02-06	2680.177	2.16E-02	0.979
DF	P02-07	2655.862	3.16E-02	0.969
DF	P02-08	2631.065	9.53E-03	0.991
DF	P02-09	2605.804	1.78E-02	0.982
DF	P02-10	2580.093	5.07E-02	0.951
DF	P02-11	2553.948	1.86E-02	0.982
DF	P02-12	2527.385	1.62E-02	0.984
DF	P02-13	2499.418	2.34E-02	0.977
DF	P02-14	2473.065	3.60E-02	0.965
DF	P02-15	2445.339	5.09E-02	0.950
DF	P02-16	2417.258	5.92E-02	0.943
DF	P03-02	2683.950	1.05E-02	0.990
DF	P03-03	2662.249	1.41E-02	0.986
DF	P03-04	2640.075	2.10E-02	0.979
DF	P03-05	2617.384	8.58E-03	0.991
DF	P03-06	2594.193	1.31E-02	0.987
DF	P03-07	2570.516	4.14E-02	0.959
DF	P03-08	2546.367	3.26E-02	0.968
DF	P03-09	2521.763	1.65E-02	0.984

## 2 km ALTITUDE

5.260 TORR H<sub>2</sub>O (IN 602 TORR AT 12.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER ( $\text{cm}^{-1}$ )	EXTINCTION ( $\text{l}/\text{km}$ )	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	2.53E-02	0.975
DF	P03-11	2471.247	4.64E-02	0.955
DF	P03-12	2445.365	5.19E-02	0.949
DF	P03-13	2419.086	5.85E-02	0.943
DF	P03-14	2392.427	9.91E-02	0.906
DF	P04-02	2597.220	1.55E-02	0.985
DF	P04-03	2576.160	1.69E-02	0.983
DF	P04-04	2554.548	2.75E-02	0.973
DF	P04-05	2532.465	1.57E-02	0.984
DF	P04-06	2509.887	2.00E-02	0.980
DF	P04-07	2486.837	2.89E-02	0.972
DF	P04-08	2463.334	4.35E-02	0.957
DF	P04-09	2439.390	5.34E-02	0.948
DF	P04-10	2414.990	5.99E-02	0.942
DF	P04-11	2390.170	2.27E-01	0.797
DF	P04-12	2364.950	3.07E 02	0.000
DF	P04-13	2339.340	8.81E 03	0.000
DF	P04-14	2313.350	3.30E 02	0.000
DF	P05-03	2491.620	3.08E-02	0.970
DF	P05-04	2470.630	3.65E-02	0.964
DF	P05-05	2449.140	5.35E-02	0.948
DF	P05-06	2427.170	5.57E-02	0.946
DF	P05-07	2404.730	6.63E 02	0.936
DF	P05-08	2381.830	2.32E 01	0.000
DF	P05-09	2358.490	8.42E 02	0.000
DF	P05-10	2334.730	1.65E 02	0.000
DF	P05-11	2310.550	1.70E 02	0.000
DF	P05-12	2285.970	6.27E 00	0.002
DF	P05-13	2261.000	4.59E 00	0.010
DF	P05-14	2235.670	7.83E-01	0.457
DF	P06-05	2367.210	1.82E 02	0.000
DF	P06-06	2345.830	7.13E 02	0.000
DF	P06-07	2323.990	7.35E 01	0.000
DF	P06-08	2301.690	9.48E 01	0.000
DF	P06-09	2278.960	8.06E 00	0.000

## 2 km ALTITUDE

5.260 TORR H<sub>2</sub>O (IN 602 TORR AT 12.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	4.79E 00	0.008
DF	P06-11	2232.250	3.81E-01	0.683
DF	P06-12	2208.290	2.21E-01	0.801
DF	P06-13	2183.960	7.83E-02	0.925
DF	P06-14	2159.260	1.95E-02	0.981
DF	P07-05	2286.540	2.63E 00	0.072
DF	P07-06	2265.740	1.51E 00	0.220
DF	P07-07	2244.470	1.13E 00	0.323
DF	P07-08	2222.760	3.53E-01	0.702
DF	P07-09	2200.630	5.10E-01	0.601
DF	P07-10	2178.070	9.98E-02	0.905
DF	P07-11	2155.110	4.94E-02	0.552
DF	P07-12	2131.770	6.12E-02	0.941
DF	P08-04	2226.720	2.54E-01	0.776
DF	P08-05	2206.950	3.05E-01	0.737
DF	P08-06	2186.700	2.86E-01	0.751
DF	P08-07	2166.010	3.41E-02	0.966
DF	P08-08	2144.870	3.03E-01	0.739
DF	P08-09	2123.310	5.32E-02	0.348
DF	P08-10	2101.340	2.70E-02	0.973
DF	P08-11	2078.970	2.28E-01	0.796
DF	P08-12	2056.210	2.95E-02	0.971
DF	P09-04	2147.460	1.35E 00	0.260
DF	P09-05	2128.230	1.34E-02	0.987
DF	P09-06	2108.540	1.87E-02	0.982
DF	P09-07	2088.400	1.13E-01	0.893
DF	P09-08	2067.830	1.86E-01	0.830
DF	P09-09	2046.830	5.26E-01	0.591
DF	P09-10	2025.420	1.14E-01	0.892

3 km ALTITUDE  
3.507 TORR H<sub>2</sub>O (IN 533 TORR AT 6.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	6.00E-02	0.942
DF	P01-02	2862.647	1.01E-02	0.990
DF	P01-03	2839.786	1.92E-02	0.981
DF	P01-04	2816.376	1.27E-02	0.987
DF	P01-05	2792.432	1.98E-02	0.980
DF	P01-06	2767.567	1.90E-02	0.981
DF	P01-07	2742.998	8.90E-03	0.991
DF	P01-08	2717.540	2.63E-02	0.974
DF	P01-09	2691.608	1.59E-02	0.984
DF	P01-10	2665.217	1.17E-02	0.988
DF	P01-11	2638.384	7.15E-02	0.931
DF	P01-12	2611.124	6.27E-03	0.994
DF	P01-13	2583.453	2.71E-02	0.973
DF	P01-14	2555.388	1.60E-02	0.984
DF	P01-15	2526.943	1.26E-02	0.987
DF	P01-16	2498.135	1.86E-02	0.982
DF	P01-17	2468.980	2.91E-02	0.971
DF	P02-02	2772.440	7.15E-02	0.931
DF	P02-03	2750.084	1.15E-02	0.999
DF	P02-04	2727.304	1.21E-02	0.988
DF	P02-05	2703.997	6.63E-03	0.993
DF	P02-06	2680.177	1.39E-02	0.986
DF	P02-07	2655.862	2.01E-02	0.980
DF	P02-08	2631.065	6.48E-03	0.994
DF	P02-09	2605.804	1.15E-02	0.989
DF	P02-10	2580.093	4.40E-02	0.957
DF	P02-11	2553.948	1.41E-02	0.986
DF	P02-12	2527.385	1.20E-02	0.988
DF	P02-13	2500.418	1.77E-02	0.982
DF	P02-14	2473.065	2.77E-02	0.973
DF	P02-15	2445.339	3.95E-02	0.961
DF	P02-16	2417.258	4.61E-02	0.955
DF	P03-02	2683.950	7.30E-03	0.993
DF	P03-03	2662.249	9.11E-03	0.991
DF	P03-04	2640.075	1.41E-02	0.986
DF	P03-05	2617.384	5.81E-03	0.994
DF	P03-06	2594.193	8.83E-03	0.991
DF	P03-07	2570.516	3.50E-02	0.966
DF	P03-08	2546.367	2.60E-02	0.974
DF	P03-09	2521.763	1.22E-02	0.988

## 3 km ALTITUDE

3.507 TORR H<sub>2</sub>O (IN 533 TORR AT 6.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	1.90E-02	0.981
DF	P03-11	2471.247	3.45E-02	0.966
DF	P03-12	2445.365	4.03E-02	0.960
DF	P03-13	2419.086	4.56E-02	0.955
DF	P03-14	2392.427	7.40E-02	0.929
DF	P04-02	2597.220	1.09E-02	0.989
DF	P04-03	2576.160	1.23E-02	0.988
DF	P04-04	2554.548	2.20E-02	0.978
DF	P04-05	2532.465	1.15E-02	0.989
DF	P04-06	2509.887	1.50E-02	0.985
DF	P04-07	2486.837	2.21E-02	0.978
DF	P04-08	2463.334	3.31E-02	0.967
DF	P04-09	2439.390	4.15E-02	0.959
DF	P04-10	2414.990	4.67E-02	0.954
DF	P04-11	2390.170	1.59E-01	0.853
DF	P04-12	2364.950	2.47E-02	0.000
DF	P04-13	2339.340	8.35E-03	0.000
DF	P04-14	2313.350	2.59E-02	0.000
DF	P05-03	2491.620	2.44E-02	0.976
DF	P05-04	2470.630	2.81E-02	0.972
DF	P05-05	2449.140	4.18E-02	0.959
DF	P05-06	2427.170	4.35E-02	0.957
DF	P05-07	2404.730	5.18E-02	0.949
DF	P05-08	2381.830	1.69E-01	0.000
DF	P05-09	2358.490	6.82E-02	0.000
DF	P05-10	2334.730	1.32E-02	0.000
DF	P05-11	2310.550	1.38E-02	0.000
DF	P05-12	2285.970	4.97E-00	0.007
DF	P05-13	2261.000	3.62E-00	0.027
DF	P05-14	2235.670	5.87E-01	0.556
DF	P06-05	2367.210	1.43E-02	0.000
DF	P06-06	2345.830	5.91E-02	0.000
DF	P06-07	2323.990	5.68E-01	0.000
DF	P06-08	2301.690	8.14E-01	0.000
DF	P06-09	2278.960	6.48E-00	0.002

## 3 km ALTITUDE

3.507 TORR H<sub>2</sub>O (IN 533 TORR AT 6.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	3.75E 00	0.024
DF	P06-11	2232.250	3.02E-01	0.739
DF	P06-12	2208.290	1.75E-01	0.840
DF	P06-13	2183.960	6.05E-02	0.941
DF	P06-14	2159.260	1.40E-02	0.986
DF	P07-05	2286.540	1.95E 00	0.142
DF	P07-06	2265.740	1.20E 00	0.301
DF	P07-07	2244.470	9.40E-01	0.391
DF	P07-08	2222.760	3.12E-01	0.732
DF	P07-09	2200.630	4.11E-01	0.663
DF	P07-10	2178.070	7.88E-02	0.924
DF	P07-11	2155.110	3.05E-02	0.970
DF	P07-12	2131.770	4.37E-02	0.957
DF	P08-04	2226.720	1.92E-01	0.825
DF	P08-05	2206.950	2.35E-01	0.791
DF	P08-06	2186.700	2.07E-01	0.813
DF	P08-07	2166.010	2.36E-02	0.977
DF	P08-08	2144.870	1.78E-01	0.837
DF	P08-09	2123.310	3.28E-02	0.968
DF	P08-10	2101.340	1.72E-02	0.983
DF	P08-11	2078.970	1.38E-01	0.871
DF	P08-12	2056.210	1.94E-02	0.981
DF	P09-04	2147.460	8.14E-01	0.443
DF	P09-05	2128.230	9.30E-03	0.991
DF	P09-06	2108.540	1.20E-02	0.988
DF	P09-07	2088.400	6.34E-02	0.939
DF	P09-08	2067.830	1.12E-01	0.894
DF	P09-09	2046.830	2.94E-01	0.745
DF	P09-10	2025.420	6.47E-02	0.937

## 4 km ALTITUDE

2.290 TORR H<sub>2</sub>O (IN 471 TORR AT 0.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	4.89E-02	0.952
DF	P01-02	2862.647	7.17E-03	0.993
DF	P01-03	2839.786	1.42E-02	0.986
DF	P01-04	2816.376	8.54E-03	0.991
DF	P01-05	2792.432	1.35E-02	0.987
DF	P01-06	2767.967	1.25E-02	0.988
DF	P01-07	2742.998	6.01E-03	0.994
DF	P01-08	2717.540	1.62E-02	0.984
DF	P01-09	2691.608	1.27E-02	0.987
DF	P01-10	2665.217	8.01E-03	0.992
DF	P01-11	2638.384	4.39E-02	0.957
DF	P01-12	2611.124	4.18E-03	0.996
DF	P01-13	2583.453	2.20E-02	0.978
DF	P01-14	2555.388	1.21E-02	0.988
DF	P01-15	2526.943	9.37E-03	0.991
DF	P01-16	2498.135	1.41E-02	0.986
DF	P01-17	2468.980	2.25E-02	0.978
DF	P02-02	2772.440	4.58E-02	0.955
DF	P02-03	2750.084	7.51E-03	0.993
DF	P02-04	2727.304	7.96E-03	0.992
DF	P02-05	2703.997	4.29E-03	0.996
DF	P02-06	2680.177	8.89E-03	0.991
DF	P02-07	2655.862	1.26E-02	0.987
DF	P02-08	2631.065	4.41E-03	0.996
DF	P02-09	2605.804	7.49E-03	0.993
DF	P02-10	2580.093	3.82E-02	0.962
DF	P02-11	2553.948	1.07E-02	0.989
DF	P02-12	2527.385	8.97E-03	0.991
DF	P02-13	2500.418	1.34E-02	0.987
DF	P02-14	2473.065	2.14E-02	0.979
DF	P02-15	2445.339	3.08E-02	0.970
DF	P02-16	2417.258	3.61E-02	0.965
DF	P03-02	2683.950	5.13E-03	0.995
DF	P03-03	2662.249	5.81E-03	0.994
DF	P03-04	2640.075	9.31E-03	0.991
DF	P03-05	2617.384	3.92E-03	0.996
DF	P03-06	2594.193	5.97E-03	0.994
DF	P03-07	2570.516	2.98E-02	0.971
DF	P03-08	2546.367	2.07E-02	0.980
DF	P03-09	2521.763	9.12E-03	0.991

4 km ALTITUDE  
2.290 TORK H<sub>2</sub>O (IN 471 TORR AT 0.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	1.44E-02	0.986
DF	P03-11	2471.247	2.60E-02	0.974
DF	P03-12	2445.365	3.14E-02	0.969
DF	P03-13	2419.086	3.57E-02	0.965
DF	P03-14	2392.427	5.56E-02	0.946
DF	P04-02	2597.220	7.72E-03	0.992
DF	P04-03	2576.160	8.97E-03	0.991
DF	P04-04	2554.548	1.76E-02	0.983
DF	P04-05	2532.465	8.54E-03	0.991
DF	P04-06	2509.887	1.13E-02	0.989
DF	P04-07	2486.837	1.70E-02	0.983
DF	P04-08	2463.334	2.53E-02	0.975
DF	P04-09	2439.390	3.24E-02	0.968
DF	P04-10	2414.990	3.66E-02	0.964
DF	P04-11	2390.170	1.12E-01	0.894
DF	P04-12	2364.950	1.97E 02	0.000
DF	P04-13	2339.340	7.83E 03	0.000
DF	P04-14	2313.350	2.02E 02	0.000
DF	P05-03	2491.620	1.95E-02	0.981
DF	P05-04	2470.630	2.17E-02	0.979
DF	P05-05	2449.140	3.27E-02	0.968
DF	P05-06	2427.170	3.40E-02	0.967
DF	P05-07	2404.730	4.06E-02	0.960
DF	P05-08	2381.830	1.22E 01	0.000
DF	P05-09	2358.490	5.50E 02	0.000
DF	P05-10	2334.730	1.05E 02	0.000
DF	P05-11	2310.550	1.11E 02	0.000
DF	P05-12	2285.970	3.94E 00	0.019
DF	P05-13	2261.000	2.84E 00	0.058
DF	P05-14	2235.670	4.45E-01	0.641
DF	P06-05	2367.210	1.13E 02	0.000
DF	P06-06	2345.830	4.88E 02	0.000
DF	P06-07	2323.990	4.37E 01	0.000
DF	P06-08	2301.690	6.94E 01	0.000
DF	P06-09	2278.960	5.19E 00	0.006

## 4 km ALTITUDE

2.290 TORR H<sub>2</sub>O (IN 471 TORR AT 0.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	2.92E 00	0.054
DF	P06-11	2232.250	2.39E-01	0.787
DF	P06-12	2208.290	1.38E-01	0.871
DF	P06-13	2183.950	4.67E-02	0.954
DF	P06-14	2159.260	1.02E-02	0.990
DF	P07-05	2286.540	1.45E 00	0.234
DF	P07-06	2265.740	0.53E-01	0.386
DF	P07-07	2244.470	1.75E-01	0.461
DF	P07-08	2222.760	2.75E-01	0.760
DF	P07-09	2200.630	3.29E-01	0.719
DF	P07-10	2178.070	6.17E-02	0.940
DF	P07-11	2155.110	1.91E-02	0.981
DF	P07-12	2131.770	3.22E-02	0.968
DF	P08-04	2226.720	1.45E-01	0.865
DF	P08-05	2206.950	1.83E-01	0.833
DF	P08-06	2186.700	1.54E-01	0.858
DF	P08-07	2166.010	1.68E-02	0.963
DF	P08-08	2144.870	1.01E-01	0.904
DF	P08-09	2123.310	2.06E-02	0.980
DF	P08-10	2101.340	1.12E-02	0.989
DF	P08-11	2078.970	8.47E-02	0.919
DF	P08-12	2056.210	1.30E-02	0.987
DF	P09-04	2147.460	4.73E-01	0.623
DF	P09-05	2128.230	6.66E-03	0.993
DF	P09-06	2108.540	7.91E-03	0.992
DF	P09-07	2088.400	3.53E-02	0.965
DF	P09-08	2067.830	6.69E-02	0.936
DF	P09-09	2046.830	1.60E-01	0.852
DF	P09-10	2025.420	3.61E-02	0.965

## 5 km ALTITUDE

1.383 TORR H<sub>2</sub>O (IN 416 TORR AT 6.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	3.96E-02	0.961
DF	P01-02	2862.647	5.05E-03	0.995
DF	P01-03	2339.725	4.85E-03	0.990
DF	P01-04	2816.376	5.51E-03	0.995
DF	P01-05	2792.432	2.87E-03	0.991
DF	P01-06	2767.967	7.83E-03	0.992
DF	P01-07	2742.998	3.87E-03	0.996
DF	P01-08	2717.540	9.27E-03	0.991
DF	P01-09	2691.608	1.04E-02	0.990
DF	P01-10	2665.217	5.33E-03	0.995
DF	P01-11	2638.384	2.49E-02	0.975
DF	P01-12	2611.124	2.67E-03	0.997
DF	P01-13	2583.453	1.76E-02	0.983
DF	P01-14	2555.388	9.13E-03	0.991
DF	P01-15	2526.943	6.89E-03	0.993
DF	P01-16	2498.135	1.06E-02	0.989
DF	P01-17	2468.980	1.72E-02	0.983
DF	P02-02	2772.440	2.73E-02	0.973
DF	P02-03	2750.084	4.63E-03	0.995
DF	P02-04	2727.304	4.96E-03	0.995
DF	P02-05	2703.997	2.60E-03	0.997
DF	P02-06	2680.177	5.34E-03	0.995
DF	P02-07	2655.862	7.46E-03	0.993
DF	P02-08	2631.065	2.91E-02	0.997
DF	P02-09	2605.804	4.69E-03	0.995
DF	P02-10	2580.093	3.29E-02	0.968
DF	P02-11	2553.948	8.07E-03	0.992
DF	P02-12	2527.385	6.62E-03	0.993
DF	P02-13	2500.418	1.01E-02	0.990
DF	P02-14	2473.065	1.64E-02	0.984
DF	P02-15	2447.339	2.38E-02	0.976
DF	P02-16	2417.238	2.81E-02	0.972
DF	P03-02	2683.950	3.53E-03	0.996
DF	P03-03	2662.249	3.48E-03	0.997
DF	P03-04	2640.075	5.72E-03	0.994
DF	P03-05	2617.384	2.55E-03	0.997
DF	P03-06	2594.193	3.92E-03	0.996
DF	P03-07	2570.516	2.52E-02	0.975
DF	P03-08	2546.367	1.64E-02	0.984
DF	P03-09	2521.763	6.70E-03	0.993

## 5 km ALTITUDE

1.383 TORR H<sub>2</sub>O (IN 416 TORR AT -6.0 DEG. C.) (Cont'd)

LASER	LINE	WAVE NUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	1.08E-02	0.989
DF	P03-11	2471.247	1.95E-02	0.981
DF	P03-12	2445.365	2.43E-02	0.976
DF	P03-13	2419.086	2.77E-02	0.973
DF	P03-14	2392.427	4.17E-02	0.959
DF	P04-02	2597.220	5.39E-03	0.995
DF	P04-03	2576.160	6.48E-03	0.994
DF	P04-04	2554.548	1.40E-02	0.986
DF	P04-05	2532.465	6.23E-03	0.994
DF	P04-06	2502.887	8.47E-03	0.992
DF	P04-07	2486.837	1.29E-02	0.987
DF	P04-08	2463.334	1.92E-02	0.981
DF	P04-09	2439.390	2.51E-02	0.975
DF	P04-10	2414.990	2.84E-02	0.972
DF	P04-11	2390.170	7.86E-02	0.924
DF	P04-12	2354.950	1.56E-02	0.000
DF	P04-13	2339.340	7.26E-03	0.000
DF	P04-14	2313.350	1.55E-02	0.000
DF	P05-03	2491.620	1.56E-02	0.985
DF	P05-04	2470.530	1.57E-02	0.923
DF	P05-05	2449.140	2.53E-02	0.975
DF	P05-06	2427.170	2.64E-02	0.974
DF	P05-07	2404.730	3.17E-02	0.969
DF	P05-08	2381.830	8.74E-03	0.000
DF	P05-09	2358.490	4.41E-02	0.000
DF	P05-10	2334.730	8.31E-01	0.000
DF	P05-11	2310.550	8.73E-01	0.000
DF	P05-12	2285.970	3.11E-00	0.044
DF	P05-13	2261.000	2.21E-00	0.109
DF	P05-14	2235.670	3.38E-01	0.714
DF	P06-05	2367.210	8.82E-01	0.000
DF	P06-06	2345.830	3.99E-02	0.000
DF	P06-07	2323.990	5.34E-01	0.000
DF	P06-08	2301.690	5.86E-01	0.000
DF	P06-09	2278.960	4.13E-00	0.016

## 5 km ALTITUDE

1.383 TORR H<sub>2</sub>O (IN 416 TORR AT -6.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	2.26E 00	0.105
DF	P06-11	2232.250	1.89E-01	0.828
DF	P06-12	2208.290	1.09E-01	0.897
DF	P06-13	2183.960	3.59E-02	0.965
DF	P06-14	2159.260	7.51E-03	0.993
DF	P07-05	2286.540	1.08E 00	0.341
DF	P07-06	2265.740	7.52E-01	0.471
DF	P07-07	2244.470	6.33E-01	0.531
DF	P07-08	2222.760	2.41E-01	0.786
DF	P07-09	2200.630	2.62E-01	0.770
DF	P07-10	2178.070	4.76E-02	0.954
DF	P07-11	2155.110	1.20E-02	0.98
DF	P07-12	2131.770	2.41E-02	0.97
DF	P08-04	2226.720	1.09E-01	0.890
DF	P08-05	2206.950	1.43E-01	0.866
DF	P08-06	2186.700	1.16E-01	0.890
DF	P08-07	2166.010	1.21E-02	0.988
DF	P08-08	2144.870	5.27E-02	0.949
DF	P08-09	2123.310	1.29E-02	0.987
DF	P08-10	2101.340	7.27E-03	0.993
DF	P08-11	2078.970	5.22E-02	0.949
DF	P08-12	2056.210	8.69E-03	0.991
DF	P09-04	2147.460	2.51E-01	0.778
DF	P09-05	2128.230	4.86E-03	0.995
DF	P09-06	2108.540	5.31E-03	0.995
DF	P09-07	2088.400	.892E-02	0.981
DF	P09-08	2067.830	76E-02	0.963
DF	P09-09	2046.830	9.97E-02	0.923
DF	P09-10	2025.420	1.86E-02	0.982

6 km ALTITUDE  
0.816 TORR H<sub>2</sub>O (IN 365 TORR AT -12.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	3.23E-02	0.968
DF	P01-02	2862.647	3.66E-03	0.996
DF	P01-03	2839.786	6.73E-03	0.993
DF	P01-04	2816.376	3.61E-03	0.996
DF	P01-05	2792.432	5.90E-03	0.994
DF	P01-06	2767.967	5.00E-03	0.995
DF	P01-07	2742.998	2.49E-03	0.998
DF	P01-08	2717.540	5.20E-03	0.995
DF	P01-09	2691.608	8.80E-03	0.991
DF	P01-10	2665.217	3.59E-03	0.996
DF	P01-11	2638.384	1.38E-02	0.986
DF	P01-12	2611.124	1.72E-03	0.998
DF	P01-13	2583.453	1.41E-02	0.986
DF	P01-14	2555.388	6.92E-03	0.993
DF	P01-15	2526.943	5.09E-03	0.995
DF	P01-16	2498.135	7.98E-03	0.992
DF	P01-17	2468.980	1.33E-02	0.987
DF	P02-02	2772.440	1.60E-02	0.984
DF	P02-03	2750.084	2.83E-03	0.997
DF	P02-04	2727.304	3.08E-03	0.997
DF	P02-05	2703.997	1.57E-03	0.998
DF	P02-06	2680.177	3.19E-03	0.997
DF	P02-07	2655.862	4.39E-03	0.996
DF	P02-08	2631.065	1.94E-03	0.998
DF	P02-09	2605.804	2.98E-03	0.997
DF	P02-10	2580.093	2.82E-02	0.972
DF	P02-11	2553.948	6.11E-03	0.994
DF	P02-12	2527.385	4.92E-03	0.995
DF	P02-13	2500.418	7.64E-03	0.992
DF	P02-14	2473.065	1.26E-02	0.987
DF	P02-15	2445.339	1.84E-02	0.982
DF	P02-16	2417.258	2.18E-02	0.978
DF	P03-02	2683.950	2.51E-03	0.997
DF	P03-03	2662.249	2.07E-03	0.998
DF	P03-04	2640.075	3.45E-03	0.997
DF	P03-05	2617.384	1.67E-03	0.998
DF	P03-06	2594.193	2.60E-03	0.997
DF	P03-07	2570.516	2.13E-02	0.979
DF	P03-08	2546.367	1.29E-02	0.987
DF	P03-09	2521.763	4.96E-03	0.995

## 6 km ALTITUDE

0.816 TORR H<sub>2</sub>O (IN 365 TORR AT -12.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	8.18E-03	0.992
DF	P03-11	2471.247	1.48E-02	0.985
DF	P03-12	2445.365	1.88E-02	0.921
DF	P03-13	2419.086	2.16E-02	0.979
DF	P03-14	2392.427	3.14E-02	0.969
DF	P04-02	2597.220	3.82E-03	0.996
DF	P04-03	2576.160	4.74E-03	0.995
DF	P04-04	2554.548	1.11E-02	0.989
DF	P04-05	2532.465	4.59E-03	0.995
DF	P04-06	2509.887	6.37E-03	0.994
DF	P04-07	2486.837	9.89E-03	0.990
DF	P04-08	2463.334	1.47E-02	0.985
DF	P04-09	2439.390	1.94E-02	0.981
DF	P04-10	2414.990	2.21E-02	0.978
DF	P04-11	2390.170	5.53E-02	0.946
DF	P04-12	2364.950	1.23E 02	0.000
DF	P04-13	2339.340	6.63E 03	0.000
DF	P04-14	2313.350	1.17E 02	0.000
DF	P05-03	2491.620	1.25E-02	0.988
DF	P05-04	2470.630	1.28E-02	0.987
DF	P05-05	2449.140	1.97E-02	0.981
DF	P05-06	2427.170	2.05E-02	0.980
DF	P05-07	2404.730	2.47E-02	0.976
DF	P05-08	2381.830	6.17E 00	0.002
DF	P05-09	2358.490	3.51E 02	0.000
DF	P05-10	2334.730	6.52E 01	0.000
DF	P05-11	2310.550	6.75E 01	0.000
DF	P05-12	2285.970	2.45E 00	0.087
DF	P05-13	2261.600	1.71E 00	0.181
DF	P05-14	2235.670	2.58E-01	0.773
DF	P06-05	2367.210	6.85E 01	0.000
DF	P06-06	2345.836	3.24E 02	0.000
DF	P06-07	2323.990	2.53E 01	0.000
DF	P06-08	2301.690	4.91E 01	0.000
DF	P06-09	2278.960	3.26E 00	0.038

## 6 km ALTITUDE

0.816 TORR H<sub>2</sub>O (IN 365 TORR AT -12.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	1.73E 00	0.178
DF	P06-11	2232.250	1.48E-01	0.863
DF	P06-12	2208.290	8.52E-02	0.918
DF	P06-13	2183.960	2.75E-02	0.973
DF	P06-14	2159.260	5.57E-03	0.994
DF	P07-05	2286.540	7.98E-01	0.450
DF	P07-06	2265.740	5.91E-01	0.554
DF	P07-07	2244.470	5.09E-01	0.601
DF	P07-08	2222.760	2.11E-01	0.810
DF	P07-09	2200.630	2.06E-01	0.814
DF	P07-10	2178.070	3.62E-02	0.964
DF	P07-11	2155.110	7.81E-03	0.992
DF	P07-12	2131.770	1.85E-02	0.982
DF	P08-04	2226.720	8.20E-02	0.921
DF	P08-05	2206.950	1.13E-01	0.893
DF	P08-06	2186.700	8.92E-02	0.915
DF	P08-07	2166.010	8.87E-03	0.991
DF	P08-08	2144.870	2.66E-02	0.974
DF	P08-09	2123.310	8.52E-03	0.992
DF	P08-10	2101.340	4.92E-03	0.995
DF	P08-11	2078.970	3.35E-02	0.967
DF	P08-12	2056.210	5.98E-03	0.994
DF	P09-04	2147.460	1.28E-01	0.880
DF	P09-05	2128.230	3.65E-03	0.996
DF	P09-06	2108.540	3.72E-03	0.996
DF	P09-07	2088.400	1.05E-02	0.990
DF	P09-08	2067.830	2.15E-02	0.979
DF	P09-09	2046.830	3.84E-02	0.962
DF	P09-10	2025.420	9.32E-03	0.991

## 7 km ALTITUDE

0.470 TORR H<sub>2</sub>O (IN 320 TORR AT -18.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	2.65E-02	0.974
DF	P01-02	2862.647	2.71E-03	0.997
DF	P01-03	2839.786	4.53E-03	0.995
DF	P01-04	2816.376	2.41E-03	0.998
DF	P01-05	2792.432	3.99E-03	0.996
DF	P01-06	2767.967	3.27E-03	0.997
DF	P01-07	2742.998	1.61E-03	0.998
DF	P01-08	2717.540	2.86E-03	0.997
DF	P01-09	2691.608	7.74E-03	0.992
DF	P01-10	2665.217	2.44E-03	0.998
DF	P01-11	2638.384	7.43E-03	0.993
DF	P01-12	2611.124	1.12E-03	0.999
DF	P01-13	2583.453	1.11E-02	0.989
DF	P01-14	2555.388	5.25E-03	0.995
DF	P01-15	2526.943	3.78E-03	0.996
DF	P01-16	2498.135	6.05E-03	0.994
DF	P01-17	2468.980	1.02E-02	0.990
DF	P02-02	2772.440	9.30E-03	0.991
DF	P02-03	2750.084	1.73E-03	0.998
DF	P02-04	2727.304	1.91E-03	0.998
DF	P02-05	2703.997	9.32E-04	0.999
DF	P02-06	2680.177	1.90E-03	0.998
DF	P02-07	2655.862	2.60E-03	0.997
DF	P02-08	2631.065	1.31E-03	0.999
DF	P02-09	2605.804	1.94E-03	0.998
DF	P02-10	2580.093	2.38E-02	0.977
DF	P02-11	2553.948	4.63E-03	0.995
DF	P02-12	2527.385	3.69E-03	0.996
DF	P02-13	2500.418	5.80E-03	0.994
DF	P02-14	2473.065	9.65E-03	0.990
DF	P02-15	2445.339	1.42E-02	0.986
DF	P02-16	2417.258	1.69E-02	0.983
DF	P03-02	2683.950	1.86E-03	0.998
DF	P03-03	2662.249	1.22E-03	0.999
DF	P03-04	2640.075	2.05E-03	0.998
DF	P03-05	2617.384	1.10E-03	0.999
DF	P03-06	2594.193	1.75E-03	0.998
DF	P03-07	2570.516	1.78E-02	0.982
DF	P03-08	2546.367	1.01E-02	0.990
DF	P03-09	2521.763	3.69E-03	0.996

7 km ALTITUDE  
0.470 TORR H<sub>2</sub>O (IN 320 TORR AT -18.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	6.20E-03	0.994
DF	P03-11	2471.247	1.13E-02	0.989
DF	P03-12	2445.365	1.45E-02	0.986
DF	P03-13	2419.086	1.67E-02	0.983
DF	P03-14	2392.427	2.36E-02	0.977
DF	P04-02	297.220	2.74E-03	0.997
DF	P04-03	2576.160	3.49E-03	0.997
DF	P04-04	2554.548	8.74E-03	0.991
DF	P04-05	2532.465	3.39E-03	0.997
DF	P04-06	2509.887	4.81E-03	0.995
DF	P04-07	2486.837	7.56E-03	0.992
DF	P04-08	2463.334	1.13E-02	0.989
DF	P04-09	2439.390	1.50E-02	0.985
DF	P04-10	2414.990	1.72E-02	0.983
DF	P04-11	2390.170	3.89E-02	0.962
DF	P04-12	2364.950	9.53E 01	0.000
DF	P04-13	2339.340	5.95E 03	0.000
DF	P04-14	2313.350	8.69E 01	0.000
DF	P05-03	2491.620	1.01E-02	0.990
DF	P05-04	2470.630	9.87E-03	0.990
DF	P05-05	2449.140	1.52E-02	0.985
DF	P05-06	2427.170	1.59E-02	0.984
DF	P05-07	2404.730	1.92E-02	0.981
DF	P05-08	2381.830	4.29E 00	0.014
DF	P05-09	2358.490	2.76E 02	0.000
DF	P05-10	2334.730	5.07E 01	0.000
DF	P05-11	2310.550	5.09E 01	0.000
DF	P05-12	2285.970	1.91E 00	0.148
DF	P05-13	2261.000	1.31E 00	0.271
DF	P05-14	2235.670	1.96E-01	0.822
DF	P06-05	2367.210	5.26E 01	0.000
DF	P06-06	2345.830	2.60E 02	0.000
DF	P06-07	2323.990	1.89E 01	0.000
DF	P06-08	2301.690	4.05E 01	0.000
DF	P06-09	2278.960	2.55E 00	0.078

7 km ALTITUDE  
0.470 TORR H<sub>2</sub>O (IN 320 TORR AT -18.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	1.30E-00	0.272
DF	P06-11	2232.250	1.14E-01	0.892
DF	P06-12	2208.290	6.63E-02	0.936
DF	P06-13	2183.960	2.09E-02	0.979
DF	P06-14	2159.260	4.14E-03	0.996
DF	P07-05	2286.540	5.88E-01	0.555
DF	P07-06	2265.740	4.59E-01	0.632
DF	P07-07	2244.470	4.04E-01	0.668
DF	P07-08	2222.760	1.82E-01	0.833
DF	P07-09	2200.630	1.60E-01	0.852
DF	P07-10	2178.070	2.70E-02	0.973
DF	P07-11	2155.110	5.32E-03	0.995
DF	P07-12	2131.770	1.43E-02	0.986
DF	P08-04	2226.720	6.10E-02	0.941
DF	P08-05	2206.950	2.91E-02	0.915
DF	P08-06	2186.700	6.88E-02	0.934
DF	P08-07	2166.010	6.61E-03	0.993
DF	P08-08	2144.870	1.31E-02	0.987
DF	P08-09	2123.310	5.97E-03	0.994
DF	P08-10	2101.340	3.47E-03	0.997
DF	P08-11	2078.970	2.23E-02	0.978
DF	P08-12	2056.210	4.20E-03	0.996
DF	P09-04	2147.460	6.31E-02	0.939
DF	P09-05	2128.230	2.77E-03	0.997
DF	P09-06	2108.540	2.72E-03	0.997
DF	P09-07	2088.400	6.18E-03	0.994
DF	P09-08	2067.830	1.26E-02	0.937
DF	P09-09	2046.830	1.79E-02	0.982
DF	P09-10	2025.420	4.56E-03	0.995

## 8 km ALTITUDE

0.238 TORR H<sub>2</sub>O (IN 279 TORR AT -25.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000M.
DF	P01-01	2884.943	2.16E-02	0.979
DF	P01-02	2862.647	2.04E-03	0.998
DF	P01-03	2839.786	2.74E-03	0.997
DF	P01-04	2816.376	1.60E-03	0.998
DF	P01-05	2792.432	2.69E-03	0.997
DF	P01-06	2767.967	2.12E-03	0.998
DF	P01-07	2742.998	1.02E-03	0.999
DF	P01-08	2717.540	1.42E-03	0.999
DF	P01-09	2691.608	6.95E-03	0.993
DF	P01-10	2665.217	1.64E-03	0.998
DF	P01-11	2638.384	3.60E-03	0.996
DF	P01-12	2611.124	7.17E-04	0.999
DF	P01-13	2583.453	8.72E-03	0.991
DF	P01-14	2555.388	4.00E-03	0.996
DF	P01-15	2526.943	2.81E-03	0.997
DF	P01-16	2498.135	4.61E-03	0.995
DF	P01-17	2468.980	7.88E-03	0.992
DF	P02-02	2772.440	5.04E-03	0.995
DF	P02-03	2750.084	1.01E-03	0.999
DF	P02-04	2727.304	1.14E-03	0.999
DF	P02-05	2703.997	5.19E-04	0.999
DF	P02-06	2680.177	1.08E-03	0.999
DF	P02-07	2655.862	1.48E-03	0.999
DF	P02-08	2631.065	8.78E-04	0.999
DF	P02-09	2605.804	1.25E-03	0.999
DF	P02-10	2580.093	1.98E-02	0.980
DF	P02-11	2553.948	3.51E-03	0.996
DF	P02-12	2527.385	2.78E-03	0.997
DF	P02-13	2500.418	4.42E-03	0.995
DF	P02-14	2473.065	7.43E-03	0.993
DF	P02-15	2445.339	1.10E-02	0.989
DF	P02-16	2417.258	1.32E-02	0.987
DF	P03-02	2683.950	1.40E-03	0.999
DF	P03-03	2662.249	6.84E-04	0.999
DF	P03-04	2640.075	1.13E-03	0.999
DF	P03-05	2617.384	7.22E-04	0.999
DF	P03-06	2594.193	1.16E-03	0.999
DF	P03-07	2570.516	1.48E-02	0.985
DF	P03-08	2546.367	7.94E-03	0.992
DF	P03-09	2521.763	2.76E-03	0.997

## 8 km ALTITUDE

0.238 TORR H<sub>2</sub>O (IN 279 TORR AT -25.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000M.
DF	P03-10	2496.718	4.73E-03	0.995
DF	P03-11	2471.247	8.74E-03	0.991
DF	P03-12	2445.365	1.12E-02	0.989
DF	P03-13	2419.086	1.30E-02	0.987
DF	P03-14	2392.427	1.78E-02	0.982
DF	P04-02	2597.220	1.96E-03	0.998
DF	P04-03	2576.160	2.59E-03	0.997
DF	P04-04	2554.548	6.90E-03	0.993
DF	P04-05	2532.465	2.52E-03	0.997
DF	P04-06	2509.887	3.65E-03	0.996
DF	P04-07	2486.837	5.81E-03	0.994
DF	P04-08	2463.334	8.57E-03	0.991
DF	P04-09	2439.390	1.16E-02	0.988
DF	P04-10	2414.990	1.34E-02	0.987
DF	P04-11	2390.170	2.72E-02	0.973
DF	P04-12	2364.950	7.32E-03	0.000
DF	P04-13	2339.340	5.27E-03	0.000
DF	P04-14	2313.350	6.28E-01	0.000
DF	P05-03	2491.620	8.23E-03	0.992
DF	P05-04	2470.630	7.62E-03	0.992
DF	P05-05	2449.140	1.18E-02	0.988
DF	P05-06	2427.170	1.24E-02	0.988
DF	P05-07	2404.730	1.50E-02	0.985
DF	P05-08	2381.830	2.90E-00	0.055
DF	P05-09	2358.490	2.17E-02	0.000
DF	P05-10	2334.730	3.93E-01	0.000
DF	P05-11	2310.550	3.70E-01	0.000
DF	P05-12	2285.970	1.49E-00	0.226
DF	P05-13	2261.000	9.91E-01	0.371
DF	P05-14	2235.670	1.50E-01	0.861
DF	P06-05	2367.210	4.03E-01	0.000
DF	P06-06	2345.830	2.08E-02	0.000
DF	P06-07	2323.990	1.40E-01	0.000
DF	P06-08	2301.690	3.22E-01	0.000
DF	P06-09	2278.960	1.96E-00	0.142

## 8 km ALTITUDE

0.238 TORR H<sub>2</sub>O (IN 279 TORR AT -25.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000M.
DF	P06-10	2355.810	9.71E-01	0.379
DF	P06-11	2232.250	8.85E-02	0.915
DF	P06-12	2208.290	5.15E-02	0.950
DF	P06-13	2183.960	1.56E-02	0.985
DF	P06-14	2159.260	3.06E-03	0.997
DF	P07-05	2286.540	4.32E-01	0.649
DF	P07-06	2265.740	3.55E-01	0.701
DF	P07-07	2244.470	3.15E-01	0.730
DF	P07-08	2222.760	1.55E-01	0.856
DF	P07-09	2200.630	1.23E-01	0.884
DF	P07-10	2178.070	1.97E-02	0.980
DF	P07-11	2155.110	3.70E-03	0.996
DF	P07-12	2131.770	1.12E-02	0.989
DF	P08-04	2226.720	4.52E-02	0.956
DF	P08-05	2206.950	6.98E-02	0.933
DF	P08-06	2186.700	5.28E-02	0.949
DF	P08-07	2166.010	4.97E-03	0.995
DF	P08-08	2144.870	5.78E-03	0.994
DF	P08-09	2123.310	4.38E-03	0.996
DF	P08-10	2101.340	2.49E-03	0.998
DF	P08-11	2078.970	1.51E-02	0.985
DF	P08-12	2056.210	2.99E-03	0.997
DF	P09-04	2147.460	2.70E-02	0.973
DF	P09-05	2128.230	2.13E-03	0.998
DF	P09-06	2108.540	2.06E-03	0.998
DF	P09-07	2088.400	3.84E-03	0.996
DF	P09-08	2067.830	7.45E-03	0.993
DF	P09-09	2046.830	7.25E-03	0.993
DF	P09-10	2025.420	1.96E-03	0.998

## 9 km ALTITUDE

0.130 TORR H<sub>2</sub>O (IN 243 TORR AT -31.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	1.77E-02	0.982
DF	P01-02	2862.647	1.58E-02	0.998
DF	P01-03	2839.786	1.79E-03	0.998
DF	P01-04	2816.376	1.15E-03	0.999
DF	P01-05	2792.432	1.91E-03	0.998
DF	P01-06	2767.967	1.51E-03	0.998
DF	P01-07	2742.998	6.78E-04	0.999
DF	P01-08	2717.540	7.60E-04	0.999
DF	P01-09	2691.608	6.41E-03	0.994
DF	P01-10	2665.217	1.16E-03	0.999
DF	P01-11	2632.384	1.88E-03	0.998
DF	P01-12	2511.124	4.88E-04	1.000
DF	P01-13	2583.453	6.82E-03	0.993
DF	P01-14	2555.388	3.07E-03	0.997
DF	P01-15	2526.943	2.12E-03	0.998
DF	P01-16	2498.135	3.54E-03	0.996
DF	P01-17	2468.980	6.09E-03	0.994
DF	P02-02	2772.440	2.97E-03	0.997
DF	P02-03	2750.084	6.30E-04	0.999
DF	P02-04	2727.304	7.24E-04	0.999
DF	P02-05	2703.997	3.10E-04	1.000
DF	P02-06	2680.177	6.58E-04	0.999
DF	P02-07	2655.862	9.30E-04	0.999
DF	P02-08	2631.065	6.21E-04	0.999
DF	P02-09	2605.804	8.68E-04	0.999
DF	P02-10	2580.093	1.63E-02	0.984
DF	P02-11	2553.948	2.69E-03	0.997
DF	P02-12	2527.385	1.2E-03	0.998
DF	P02-13	2500.418	3.1E-03	0.997
DF	P02-14	2473.065	5.7E-03	0.994
DF	P02-15	2445.339	8.53E-03	0.992
DF	P02-16	2417.258	1.03E-02	0.990
DF	P03-02	2683.950	1.13E-03	0.999
DF	P03-03	2662.249	4.13E-04	1.000
DF	P03-04	2640.075	6.69E-04	0.999
DF	P03-05	2617.384	5.04E-04	0.999
DF	P03-06	2594.193	8.11E-04	0.999
DF	P03-07	2570.516	1.21E-02	0.988
DF	P03-08	2546.367	6.21E-03	0.994
DF	P03-09	2521.763	2.09E-03	0.998

9 km ALTITUDE  
0.130 TORR H<sub>2</sub>O (IN 243 TORR AT -31.0 DEG. C) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/cm)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	3.64E-03	0.996
DF	P03-11	2471.247	6.80E-03	0.993
DF	P03-12	2445.365	8.64E-03	0.991
D*	P03-13	2419.086	1.01E-02	0.990
DF	P03-14	2392.427	1.35E-02	0.987
DF	P04-02	2597.220	1.44E-03	0.999
DF	P04-03	2576.160	1.95E-03	0.998
DF	P04-04	2554.548	5.42E-03	0.995
DF	P04-05	2532.465	1.90E-03	0.998
DF	P04-06	2509.887	2.79E-03	0.997
DF	P04-07	2486.837	4.47E-03	0.996
DF	P04-08	2463.334	6.70E-03	0.993
DF	P04-09	2439.390	9.02E-03	0.991
DF	P04-10	2414.990	1.04E-02	0.990
DF	P04-11	2390.170	1.95E-02	0.981
DF	P04-12	2364.950	5.59E 01	0.000
DF	P04-13	2339.340	4.58E 03	0.000
DF	P04-14	2313.350	4.54E 01	0.000
DF	P05-03	2291.620	6.74E-03	0.995
DF	P05-04	2470.630	5.89E-03	0.994
DF	P05-05	2449.140	9.10E-03	0.997
DF	P05-06	2427.170	9.64E-03	0.990
DF	P05-07	2404.730	1.16E-02	0.988
DF	P05-08	2381.830	1.97E 00	0.139
DF	P05-09	2358.490	1.70E-02	0.000
DF	P05-10	2334.730	3.02E 01	0.000
DF	P05-11	2310.550	2.68E 01	0.000
DF	P05-12	2285.970	1.16E 00	0.314
DF	P05-13	2261.000	7.48E-01	0.474
DF	P05-14	2235.670	1.14E-01	0.802
DF	P06-05	2367.210	3.06E 01	0.000
D*	P06-06	2345.830	1.65E 02	0.300
DF	P06-07	2323.990	1.03E 01	0.400
DF	P06-08	2301.690	2.57E 01	0.900
DF	P06-09	2278.960	1.51E 00	0.221

## 9 km A.ITUDE

0.130 TORR H<sub>2</sub>O (IN 243 TORR AT -31.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	1.21E-01	0.486
DF	P06-11	2232.250	0.80E-02	0.934
DF	P06-12	2208.290	3.97E-02	0.961
DF	P06-13	2183.960	1.17E-02	0.988
DF	P06-14	2159.260	2.28E-03	0.998
DF	P07-05	2286.540	3.20E-01	0.726
DF	P07-06	2265.740	2.74E-01	0.760
DF	P07-07	2244.470	2.44E-01	0.783
DF	P07-08	2222.760	1.32E-01	0.876
DF	P07-09	2200.630	9.44E-02	0.910
DF	P07-10	2178.070	1.43E-02	0.986
DF	P07-11	2155.110	2.72E-03	0.997
DF	P07-12	2131.770	8.84E-03	0.991
DF	P08-04	2226.720	3.02E-02	0.967
DF	P08-05	2206.950	5.4E-02	0.947
DF	P08-06	2186.700	4.0E-02	0.960
DF	P08-07	2166.010	3.78E-03	0.996
DF	P08-08	2144.870	2.92E-03	0.997
DF	P08-09	2123.310	3.47E-03	0.997
DF	P08-10	2101.340	1.89E-03	0.998
DF	P08-11	2078.970	1.06E-02	0.989
DF	P08-12	2056.210	2.18E-03	0.998
DF	P09-04	2147.460	1.27E-02	0.987
DF	P09-05	2128.230	1.66E-03	0.998
DF	P09-06	2108.540	1.64E-03	0.998
DF	P09-07	2088.400	2.78E-03	0.997
DF	P09-08	2067.830	4.94E-03	0.995
DF	P09-09	2046.810	3.27E-03	0.997
DF	P09-10	2025.420	9.16E-04	0.999

## 10 km ALTITUDE

0.060 TORR H<sub>2</sub>O (IN 211 TORR AT -38.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	1.44E-02	0.986
DF	P01-02	2862.647	1.23E-03	0.999
DF	P01-03	2839.786	1.03E-03	0.999
DF	P01-04	2816.376	8.33E-04	0.999
DF	P01-05	2792.432	1.36E-03	0.999
DF	P01-06	2767.967	1.08E-03	0.999
DF	P01-07	2742.998	4.44E-04	1.000
DF	P01-08	2717.540	3.66E-04	1.000
DF	P01-09	2691.608	5.81E-03	0.994
DF	P01-10	2665.217	8.03E-04	0.999
DF	P01-11	2638.384	8.82E-04	0.999
DF	P01-12	2611.124	3.30E-04	1.000
DF	P01-13	2583.453	5.27E-03	0.995
DF	P01-14	2555.388	2.36E-03	0.998
DF	P01-15	2526.943	1.60E-03	0.998
DF	P01-16	2498.135	2.72E-03	0.997
DF	P01-17	2468.980	4.71E-03	0.995
DF	P02-02	2772.440	1.67E-03	0.998
DF	P02-03	2750.084	3.81E-04	1.000
DF	P02-04	2727.304	4.46E-04	1.000
DF	P02-05	2703.997	1.74E-04	1.000
DF	P02-06	2680.177	3.89E-04	1.000
DF	P02-07	2655.862	5.86E-04	0.999
DF	P02-08	2631.065	4.37E-04	1.000
DF	P02-09	2605.804	6.04E-04	0.999
DF	P02-10	2580.093	1.31E-02	0.987
DF	P02-11	2553.948	2.05E-03	0.993
DF	P02-12	2527.385	1.62E-03	0.998
DF	P02-13	2500.418	2.60E-03	0.997
DF	P02-14	2473.065	4.41E-03	0.996
DF	P02-15	2445.339	6.60E-03	0.993
DF	P02-16	2417.258	7.97E-03	0.992
DF	P03-02	2683.950	9.23E-04	0.999
DF	P03-03	2662.249	2.49E-04	1.000
DF	P03-04	2640.075	3.76E-04	1.000
DF	P03-05	2617.384	1.52E-04	1.000
DF	P03-06	2594.193	5.63E-04	0.999
DF	P03-07	2570.516	9.88E-03	0.990
DF	P03-08	2546.367	4.82E-03	0.993
DF	P03-09	2521.763	1.19E-03	0.994

10 km ALTITUDE  
0.060 TORR H<sub>2</sub>O (IN 211 TORR AT -38.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	2.80E-03	0.997
DF	P03-11	2471.247	5.30E-03	0.995
DF	P03-12	2445.365	6.67E-03	0.993
DF	P03-13	2419.086	7.88E-03	0.992
DF	P03-14	2392.427	1.03E-02	0.990
DF	P04-02	2597.220	1.04E-03	0.999
DF	P04-03	2576.160	1.47E-03	0.999
DF	P04-04	2554.548	4.24E-03	0.996
DF	P04-05	2532.465	1.43E-03	0.999
DF	P04-06	2509.887	2.14E-03	0.998
DF	P04-07	2486.837	3.44E-03	0.997
DF	P04-08	2463.334	5.18E-03	0.995
DF	P04-09	2439.390	6.99E-03	0.993
DF	P04-10	2414.990	8.09E-03	0.992
DF	P04-11	2390.170	1.38E-02	0.986
DF	P04-12	2364.950	4.20E 01	0.000
DF	P04-13	2339.360	3.91E 03	0.000
DF	P04-14	2313.350	3.17E 01	0.000
DF	P05-03	2491.620	5.49E-03	0.995
DF	P05-04	2470.630	4.55E-03	0.995
DF	P05-05	2449.140	7.03E-03	0.993
DF	P05-06	2427.170	7.49E-03	0.993
DF	P05-07	2404.730	9.04E-03	0.991
DF	P05-08	2381.830	1.29E 00	0.274
DF	P05-09	2358.490	1.32E 02	0.000
DF	P05-10	2334.730	2.31E 01	0.000
DF	P05-11	2310.550	1.86E 01	0.000
DF	P05-12	2285.970	8.97E-01	0.405
DF	P05-13	2261.000	5.57E-01	0.573
DF	P05-14	2235.670	8.67E-02	0.917
DF	P06-05	2367.210	2.31E 01	0.000
DF	P06-06	2345.850	1.31E 02	0.000
DF	P06-07	2323.990	7.45E 00	0.001
DF	P06-08	2301.690	1.96E 01	0.000
DF	P06-09	2278.960	1.14E 00	0.320

## 10 km ALTITUDE

0.060 TORR H<sub>2</sub>O ON 211 TORR AT -380 DEG C (Cont'd)

LASER	LINE	WAVENUMBER (cm <sup>-1</sup> )	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M
DF	P06-10	2255.810	5.26E-01	0.591
DF	P06-11	2232.250	5.19E-02	0.949
DF	P06-12	2208.290	3.05E-02	0.970
DF	P06-13	2183.960	8.53E-03	0.992
DF	P-14	2159.260	1.69E-03	0.998
DF	P07-05	2286.540	2.35E-01	0.790
DF	P07-06	2265.740	2.09E-01	0.812
DF	P07-07	2244.470	1.86E-01	0.831
DF	P07-08	2222.760	1.10E-01	0.895
DF	P07-09	2200.630	7.13E-02	0.931
DF	P07-10	2178.070	1.01E-02	0.990
DF	P07-11	2155.110	2.00E-03	0.998
DF	P07-12	2131.770	6.94E-03	0.993
DF	P08-04	2226.720	2.48E-02	0.975
DF	P08-05	2206.950	4.21E-02	0.959
DF	P08-06	2186.700	3.09E-02	0.970
DF	P08-07	2166.010	2.88E-03	0.997
DF	P08-08	2144.870	1.44E-03	0.999
DF	P08-09	2123.310	2.83E-03	0.997
DF	P08-10	2101.340	1.44E-03	0.999
DF	P08-11	2078.970	7.48E-03	0.993
DF	P08-12	2056.210	1.59E-03	0.998
DF	P09-04	2147.460	5.34E-03	0.995
DF	P09-05	2128.230	1.28E-03	0.999
DF	P09-06	2108.540	1.33E-03	0.999
DF	P09-07	2088.400	2.14E-03	0.998
DF	P09-08	2067.830	3.39E-03	0.997
DF	P09-09	2046.830	1.32E-03	0
DF	P09-10	2025.420	3.67E-04	1

## 11 km ALTITUDE

0.031 TORR H<sub>2</sub>O (IN 182 TORR AT -44.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000M.
DF	P01-01	2884.943	1.19E-02	0.988*
DF	P01-02	2862.647	9.60E-04	0.999
DF	P01-03	2839.786	6.45E-04	0.999
DF	P01-04	2816.376	6.37E-04	0.999
DF	P01-05	2792.432	1.01E-03	0.999
DF	P01-06	2767.967	8.34E-04	0.999
DF	P01-07	2742.998	3.05E-04	1.000
DF	P01-08	2717.540	1.94E-04	1.000
DF	P01-09	2691.608	5.46E-03	0.995
DF	P01-10	2665.217	5.74E-04	0.999
DF	P01-11	2638.384	4.57E-04	1.000
DF	P01-12	2611.124	2.35E-04	1.000
DF	P01-13	2583.453	4.06E-03	0.996
DF	P01-14	2555.388	1.80E-03	0.998
DF	P01-15	2526.943	1.21E-03	0.999
DF	P01-16	2498.135	2.09E-03	0.998
DF	P01-17	2468.980	3.62E-03	0.996
DF	P02-02	2772.440	1.04E-03	0.999
DF	P02-03	2750.084	2.47E-04	1.000
DF	P02-04	2727.304	2.91E-04	1.000
DF	P02-05	2703.997	1.05E-04	1.000
DF	P02-06	2680.177	2.49E-04	1.000
DF	P02-07	2655.362	4.10E-04	1.000
DF	P02-08	2631.065	3.19E-04	1.000
DF	P02-09	2605.804	4.41E-04	1.000
DF	P02-10	2580.093	1.04E-02	0.990
DF	P02-11	2553.948	1.57E-03	0.998
DF	P02-12	2527.385	1.25E-03	0.999
DF	P02-13	2500.418	2.00E-03	0.998
DF	P02-14	2473.065	3.39E-03	0.997
DF	P02-15	2445.339	5.09E-03	0.995
DF	P02-16	2417.258	6.16E-03	0.994
DF	P03-02	2681.950	7.90E-04	0.999*
DF	P03-03	2662.249	1.52E-04	1.000
DF	P03-04	2643.639	2.31E-04	1.000
DF	P03-05	2617.384	2.59E-04	1.000
DF	P03-06	2594.193	4.04E-04	1.000
DF	P03-07	2570.516	7.92E-03	0.992
DF	P03-08	2546.367	3.73E-03	0.996
DF	P03-09	2521.763	1.21E-03	0.999

## 11 km ALTITUDE

0.031 TORR H<sub>2</sub>O (IN 182 TORR AT -44.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000M.
DF	P03-10	2496.718	2.15E-03	0.998
DF	P03-11	2471.247	4.12E-03	0.996
DF	P03-12	2445.365	5.13E-03	0.995
DF	P03-13	2419.086	6.09E-03	0.994
DF	P03-14	2392.427	7.77E-03	0.992
DF	P04-02	2597.220	7.66E-04	0.999
DF	P04-03	2576.160	1.11E-03	0.999
DF	P04-04	2554.548	3.29E-03	0.997
DF	P04-05	2532.465	1.08E-03	0.999
DF	P04-06	2509.887	1.64E-03	0.998
DF	P04-07	2486.837	2.65E-03	0.997
DF	P04-08	2463.334	3.98E-03	0.996
DF	P04-09	2439.390	5.39E-03	0.995
DF	P04-10	2414.990	6.25E-03	0.994
DF	P04-11	2390.170	1.00E-02	0.990
DF	P04-12	2364.950	3.14E 01	0.000
DF	P04-13	2339.340	3.27E 03	0.000
DF	P04-14	2313.350	2.22E 01	0.000
DF	P05-03	2491.620	4.48E-03	0.996
DF	P05-04	2470.630	3.50E-03	0.997
DF	P05-05	2449.140	5.41E-03	0.995
DF	P05-06	2427.170	5.78E-03	0.994
DF	P05-07	2404.730	6.98E-03	0.993
DF	P05-08	2381.830	8.53E-01	0.426
DF	P05-09	2358.490	1.01E-02	0.000
DF	P05-10	2334.730	1.75E 01	0.000
DF	P05-11	2310.550	1.29E 01	0.000
DF	P05-12	2285.970	6.91E-01	0.501
DF	P05-13	2261.000	4.13E-01	0.661
DF	P05-14	2235.670	6.55E-02	0.937
DF	P06-05	2367.210	1.73E 01	0.000
DF	P06-06	2345.830	1.02E 02	0.000
DF	P06-07	2323.990	5.38E 00	0.005
DF	P06-08	2301.690	1.50E 01	
DF	P06-09	2278.960	8.65E-01	0.421

## 11 km ALTITUDE

0.031 TORR H<sub>2</sub>O (IN 182 TORR AT -44.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000M
DF	P06-10	2255.810	3.83E-01	0.682
DF	P06-11	2232.250	3.94E-02	0.961
DF	P06-12	2208.290	2.32E-02	0.977
DF	P06-13	2183.960	6.24E-03	0.994
DF	P06-14	2159.260	1.26E-03	0.999
DF	P07-05	2286.540	1.74E-01	0.840
DF	P07-06	2265.740	1.59E-01	0.853
DF	P07-07	2244.470	1.40E-01	0.870
DF	P07-08	2222.760	9.15E-02	0.913
DF	P07-09	2200.630	5.35E-02	0.948
DF	P07-10	2178.070	7.17E-03	0.993
DF	P07-11	2155.110	1.50E-03	0.999
DF	P07-12	2131.770	5.42E-03	0.995
DF	P08-04	2226.720	1.84E-02	0.982
DF	P08-05	2206.950	3.23E-02	0.968
DF	P08-06	2186.700	2.33E-02	0.977
DF	P08-07	2166.010	2.19E-03	0.998
DF	P08-08	2144.870	8.52E-04	0.999
DF	P08-09	2123.310	2.38E-03	0.998
DF	P08-10	2101.340	1.12E-03	0.999
DF	P08-11	2078.970	5.34E-03	0.995
DF	P08-12	2056.210	1.17E-03	0.999
DF	P09-04	2147.460	2.61E-03	0.997
DF	P09-05	2128.230	9.91E-04	0.999
DF	P09-06	2108.540	1.13E-03	0.999
DF	P09-07	2088.400	1.77E-03	0.998
DF	P09-08	2067.830	2.48E-03	0.998
DF	P09-09	2046.830	6.22E-04	0.999
DF	P09-10	2025.420	1.62E-04	1.000

## 12 km ALTITUDE

0.013 TORR H<sub>2</sub>O (IN 157 TORR AT -51.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	9.53E-03	0.991
DF	P01-02	2862.647	7.48E-04	0.999
DF	P01-03	2839.786	3.67E-04	1.000
DF	P01-04	2816.376	4.90E-04	1.000
DF	P01-05	2792.432	7.45E-04	0.999
DF	P01-06	2767.967	6.44E-04	0.999
DF	P01-07	2742.998	2.09E-04	1.000
DF	P01-08	2717.540	9.74E-05	1.000
DF	P01-09	2691.608	5.08E-03	0.995
DF	P01-10	2665.217	4.06E-04	1.000
DF	P01-11	2638.384	2.28E-04	1.000
DF	P01-12	2611.124	1.68E-04	1.000
DF	P01-13	2583.453	3.09E-03	0.997
DF	P01-14	2555.388	1.38E-03	0.999
DF	P01-15	2526.943	9.12E-04	0.999
DF	P01-16	2498.135	1.60E-03	0.998
DF	P01-17	2468.980	2.78E-03	0.997
DF	P02-02	2772.440	6.46E-04	0.999
DF	P02-03	2750.084	1.60E-04	1.000
DF	P02-04	2727.304	1.88E-04	1.000
DF	P02-05	2703.997	6.27E-05	1.000
DF	P02-06	2680.177	1.59E-04	1.000
DF	P02-07	2655.862	2.95E-04	1.000
DF	P02-08	2631.065	2.33E-04	1.000
DF	P02-09	2605.804	3.23E-04	1.000
DF	P02-10	2580.093	8.14E-03	0.992
DF	P02-11	2553.948	1.19E-03	0.999
DF	P02-12	2527.385	9.64E-04	0.999
DF	P02-13	2500.418	1.53E-03	0.998
DF	P02-14	2473.065	2.80E-03	0.997
DF	P02-15	2445.339	3.91E-03	0.996
DF	P02-16	2417.258	4.75E-03	0.995
DF	P03-02	2683.950	6.77E-04	0.999
DF	P03-03	2662.249	9.70E-05	1.000
DF	P03-04	2640.075	1.42E-04	1.000
DF	P03-05	2617.384	9.47E-05	1.000
DF	P03-06	2594.193	1.13E-04	1.000
DF	P03-07	2570.516	2.69E-03	0.997
DF	P03-08	2546.367	1.19E-03	0.999
DF	P03-09	2521.763	3.69E-04	1.000

## 12 km ALTITUDE

0.013 TORR H<sub>2</sub>O (IN 157 TORR AT -51.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	6.63E-04	0.999
DF	P03-11	2471.247	1.37E-03	0.999
DF	P03-12	2445.365	1.58E-03	0.998
DF	P03-13	2419.086	1.89E-03	0.998
DF	P03-14	2392.427	2.33E-03	0.998
DF	P04-02	2597.220	2.24E-04	1.000
DF	P04-03	2576.160	3.46E-04	1.000
DF	P04-04	2554.548	1.03E-03	0.999
DF	P04-05	2532.465	3.27E-04	1.000
DF	P04-06	2509.887	5.05E-04	0.999
DF	P04-07	2486.837	8.15E-04	0.999
DF	P04-08	2463.334	1.23E-03	0.999
DF	P04-09	2439.390	1.66E-03	0.998
DF	P04-10	2414.990	1.94E-03	0.998
DF	P04-11	2390.170	2.77E-03	0.997
DF	P04-12	2364.950	9.02E 00	0.000
DF	P04-13	2339.340	1.24E 03	0.000
DF	P04-14	2313.350	5.48E 00	0.004
DF	P05-03	2491.620	1.89E-03	0.998
DF	P05-04	2470.630	1.08E-03	0.999
DF	P05-05	2449.140	1.66E-03	0.998
DF	P05-06	2427.170	1.79E-03	0.998
DF	P05-07	2404.730	2.17E-03	0.998
DF	P05-08	2381.830	1.81E-01	0.834
DF	P05-09	2358.490	3.10E 01	0.000
DF	P05-10	2334.730	5.16E 00	0.006
DF	P05-11	2310.550	3.08E 00	0.046
DF	P05-12	2285.970	2.13E-01	0.908
DF	P05-13	2261.000	1.16E-01	0.891
DF	P05-14	2235.670	1.95E-02	0.981
DF	P06-05	2367.210	4.94E 00	0.007
DF	P06-06	2345.830	3.24E 01	0.000
DF	P06-07	2323.990	1.44E 00	0.238
DF	P06-08	2301.690	5.63E 00	0.004
DF	P06-09	2278.960	2.92E-01	0.747

## 12 km ALTITUDE

0.013 TORR H<sub>2</sub>O (IN 157 TORR AT -51.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	2.72E-01	0.762
DF	P06-11	2232.250	2.97E-02	0.971
DF	P06-12	2208.290	1.75E-02	0.983
DF	P06-13	2183.960	4.45E-03	0.996
DF	P06-14	2159.260	9.30E-04	0.999
DF	P07-05	2286.540	1.28E-01	0.880
DF	P07-06	2265.740	1.19E-01	0.888
DF	P07-07	2244.470	1.03E-01	0.902
DF	P07-08	2222.760	7.41E-02	0.929
DF	P07-09	2200.630	3.95E-02	0.961
DF	P07-10	2178.070	4.92E-03	0.995
DF	P07-11	2155.110	1.12E-03	0.999
DF	P07-12	2131.770	4.21E-03	0.996
DF	P08-04	2226.720	1.36E-02	0.987
DF	P08-05	2206.950	2.42E-02	0.976
DF	P08-06	2186.700	1.73E-02	0.983
DF	P08-07	2166.010	1.65E-03	0.998
DF	P08-08	2144.870	5.40E-04	0.999
DF	P08-09	2123.310	2.02E-03	0.998
DF	P08-10	2101.340	8.65E-04	0.999
DF	P08-11	2078.970	3.75E-03	0.996
DF	P08-12	2056.210	8.57E-04	0.999
DF	P09-04	2147.469	1.31E-03	0.999
DF	P09-05	2128.230	7.61E-04	0.999
DF	P09-06	2108.540	9.73E-04	0.999
DF	P09-07	2088.400	1.50E-03	0.998
DF	P09-08	2067.830	1.85E-03	0.998
DF	P09-09	2046.830	2.96E-04	1.000
DF	P09-10	2025.420	6.43E-05	1.000

## 13 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 134 TORR AT -57.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 16.0 M.
DF	P01-01	2884.943	7.54E-03	0.992
DF	P01-02	2862.647	5.77E-04	0.999
DF	P01-03	2839.786	2.24E-04	1.000
DF	P01-04	2816.376	3.81E-04	1.000
DF	P01-05	2792.432	5.56E-04	0.999
DF	P01-06	2767.967	5.13E-04	0.999
DF	P01-07	2742.998	1.47E-04	1.000
DF	P01-08	2717.540	5.40E-05	1.000
DF	P01-09	2691.608	4.72E-03	0.995
DF	P01-10	2665.217	2.90E-04	1.000
DF	P01-11	2638.384	1.28E-04	1.000
DF	P01-12	2611.124	1.23E-04	1.000
DF	P01-13	2583.453	2.35E-03	0.998
DF	P01-14	2555.388	1.04E-03	0.999
DF	P01-15	2526.943	6.86E-04	0.999
DF	P01-16	2498.135	1.22E-03	0.999
DF	P01-17	2468.980	2.11E-03	0.998
DF	P02-02	2772.440	4.31E-04	1.000
DF	P02-03	2750.084	1.08E-04	1.000
DF	P02-04	2727.304	1.21E-04	1.000
DF	P02-05	2703.997	3.99E-05	1.000
DF	P02-06	2680.177	1.07E-04	1.000
DF	P02-07	2655.862	2.23E-04	1.000
DF	P02-08	2631.065	1.72E-04	1.000
DF	P02-09	2605.804	2.40E-04	1.000
DF	P02-10	2580.093	6.24E-03	0.994
DF	P02-11	2553.948	9.01E-04	0.999
DF	P02-12	2527.385	7.40E-04	0.999
DF	P02-13	2500.418	1.16E-03	0.999
DF	P02-14	2473.665	1.97E-03	0.998
DF	P02-15	2445.339	2.97E-03	0.997
DF	P02-16	2417.258	3.62E-03	0.996
DF	P03-02	2693.950	5.87E-04	0.999
DF	P03-03	2662.249	6.57E-05	1.000
DF	P03-04	2640.075	9.39E-05	1.000
DF	P03-05	2617.384	1.48E-04	1.000
DF	P03-06	2594.193	2.19E-04	1.000
DF	P03-07	2570.516	4.90E-03	0.995
DF	P03-08	2546.367	2.17E-03	0.998
DF	P03-09	2521.763	6.95E-04	0.999

## 13 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 134 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE: AT 1000 M.
DF	P03-10	2496.718	1.25E-03	0.999
DF	P03-11	2471.247	2.45E-03	0.998
DF	P03-12	2445.365	2.98E-03	0.997
DF	P03-13	2419.086	3.58E-03	0.996
DF	P03-14	2392.427	4.42E-03	0.996
DF	P04-02	2597.220	3.97E-04	1.000
DF	P04-03	2576.160	6.35E-04	0.999
DF	P04-04	2554.548	1.94E-03	0.998
DF	P04-05	2532.465	6.17E-04	0.999
DF	P04-06	2509.887	9.52E-04	0.999
DF	P04-07	2486.837	1.54E-03	0.998
DF	P04-08	2463.334	2.32E-03	0.998
DF	P04-09	2439.390	3.15E-03	0.997
DF	P04-10	2414.990	3.67E-03	0.996
DF	P04-11	2390.170	5.25E-03	0.995
DF	P04-12	2364.950	1.68E 01	0.000
DF	P04-13	2339.340	2.15E 03	0.000
DF	P04-14	2313.350	1.00E 01	0.000
DF	P05-03	2491.620	2.89E-03	0.997
DF	P05-04	2470.630	2.05E-03	0.998
DF	P05-05	2449.140	3.15E-03	0.997
DF	P05-06	2427.170	3.40E-03	0.997
DF	P05-07	2404.730	4.09E-03	0.996
DF	P05-08	2381.830	3.44E-01	0.704
DF	P05-09	2358.490	5.86E-01	0.000
DF	P05-10	2334.730	9.78E 00	0.000
DF	P05-11	2310.550	5.60E 00	0.004
DF	P05-12	2285.970	4.02E-01	0.669
DF	P05-13	2261.000	2.19E-01	0.803
DF	P05-14	2235.670	3.65E-02	0.964
DF	P06-05	2367.210	9.36E 00	0.000
DF	P06-06	2345.830	6.10E 01	0.000
DF	P06-07	2323.990	2.68E 00	0.068
DF	P06-08	2301.690	7.81E 00	0.000
DF	P06-09	2278.960	4.78E-01	0.620

13 km ALTITUDE  
0.006 TORR H<sub>2</sub>O (IN 134 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	1.93E-01	0.825
DF	P06-11	2232.250	2.21E-02	0.978
DF	P06-12	2208.290	1.31E-02	0.987
DF	P06-13	2183.960	3.16E-03	0.997
DF	P06-14	2159.260	6.87E-04	0.999
DF	P07-05	2286.540	9.37E-02	0.911
DF	P07-06	2265.740	8.81E-02	0.916
DF	P07-07	2244.470	7.54E-02	0.927
DF	P07-08	2222.760	5.99E-02	0.942
DF	P07-09	2200.630	2.89E-02	0.972
DF	P07-10	2178.070	3.38E-03	0.997
DF	P07-11	2155.110	8.31E-04	0.999
DF	P07-12	2131.770	3.22E-03	0.997
DF	P08-04	2226.720	1.00E-02	0.990
DF	P08-05	2206.950	1.80E-02	0.982
DF	P08-06	2186.700	1.27E-02	0.987
DF	P08-07	2166.010	1.24E-03	0.999
DF	P08-08	2144.870	3.77E-04	1.000
DF	P08-09	2123.310	1.72E-03	0.998
DF	P08-10	2101.340	6.69E-04	0.999
DF	P08-11	2078.970	2.63E-03	0.997
DF	P08-12	2056.210	6.23E-04	0.999
DF	P09-04	2147.460	7.78E-04	0.999
DF	P09-05	2128.230	5.79E-04	0.999
DF	P09-06	2108.540	8.61E-04	0.999
DF	P09-07	2088.400	1.30E-03	0.999
DF	P09-08	2067.830	1.39E-03	0.999
DF	P09-09	2046.830	1.67E-04	1.000
DF	P09-10	2025.420	2.88E-05	1.000

## 14 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 115 TORR AT -57.0 DEG. C.)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	5.79E-03	0.994
DF	P01-02	2862.647	4.34E-04	1.000
DF	P01-03	2839.786	2.19E-04	0.990
DF	P01-04	2816.376	2.99E-04	1.000
DF	P01-05	2792.432	4.13E-04	1.000
DF	P01-06	2767.967	4.34E-04	1.000
DF	P01-07	2742.998	1.09E-04	1.000
DF	P01-08	2717.540	4.29E-05	1.000
DF	P01-09	2691.608	4.44E-03	0.996
DF	P01-10	2665.217	2.17E-04	1.000
DF	P01-11	2638.384	1.01E-04	1.000
DF	P01-12	2511.124	9.10E-05	1.000
DF	P01-13	2583.453	1.81E-03	0.998
DF	P01-14	2555.388	7.65E-04	0.999
DF	P01-15	2526.943	5.02E-04	0.999
DF	P01-16	2498.135	8.94E-04	0.999
DF	P01-17	2468.980	1.55E-03	0.998
DF	P02-02	2772.440	3.28E-04	1.000
DF	P02-03	2750.084	8.18E-05	1.000
DF	P02-04	2727.304	9.46E-05	1.000
DF	P02-05	2703.997	3.07E-05	1.000
DF	P02-06	2680.177	8.05E-05	1.000
DF	P02-07	2655.862	1.78E-04	1.000
DF	P02-08	2631.065	1.28E-04	1.000
DF	P02-09	2605.804	1.78E-04	1.000
DF	P02-10	2580.093	4.71E-03	0.995
DF	P02-11	2553.948	6.61E-04	0.999
DF	P02-12	2527.385	5.54E-04	0.999
DF	P02-13	2500.418	8.51E-04	0.999
DF	P02-14	2473.065	1.44E-03	0.999
DF	P02-15	2445.339	2.17E-03	0.998
DF	P02-16	2417.258	2.65E-03	0.997
DF	P03-02	2683.950	5.27E-04	0.999
DF	P03-03	2662.249	4.96E-05	1.000
DF	P03-04	2640.075	7.12E-05	1.000
DF	P03-05	2617.384	1.93E-04	1.000
DF	P03-06	2594.193	2.90E-04	1.000
DF	P03-07	2570.516	6.29E-03	0.994
DF	P03-08	2546.367	2.86E-03	0.997
DF	P03-09	2521.763	9.19E-04	0.999

14 km ALTITUDE  
0.006 TORR H<sub>2</sub>O (IN 115 TORR AT -57.0 DEG. C.) (Cont'd)

LASEK	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	1.65E-03	0.998
DF	P03-11	2471.247	3.19E-03	0.997
DF	P03-12	2445.365	3.93E-03	0.996
DF	P03-13	2419.086	4.70E-03	0.995
DF	P03-14	2392.427	5.88E-03	0.994
DF	P04-02	2597.220	5.51E-04	0.999
DF	P04-03	2576.160	8.43E-04	0.999
DF	P04-04	2554.548	2.54E-03	0.997
DF	P04-05	2532.465	8.19E-04	0.999
DF	P04-06	2509.887	1.25E-03	0.999
DF	P04-07	2486.837	2.03E-03	0.998
DF	P04-08	2463.334	3.06E-03	0.997
DF	P04-09	2439.390	4.14E-03	0.996
DF	P04-10	2414.990	4.82E-03	0.995
DF	P04-11	2390.170	7.22E-03	0.993
DF	P04-12	2364.950	2.30E 01	0.000
DF	P04-13	2339.340	2.68E 03	0.000
DF	P04-14	2313.350	1.49E 01	0.000
DF	P05-03	2491.620	3.61E-03	0.996
DF	P05-04	2470.630	2.69E-03	0.997
DF	P05-05	2449.140	4.15E-03	0.996
DF	P05-06	2427.170	4.46E-03	0.996
DF	P05-07	2404.730	5.37E-03	0.995
DF	P05-08	2381.830	5.40E-01	0.583
DF	P05-09	2358.490	7.75E 01	0.000
DF	P05-10	2334.730	1.31E 01	0.000
DF	P05-11	2310.550	8.50E 00	0.000
DF	P05-12	2285.970	5.30E-01	0.589
DF	P05-13	2261.000	3.02E-01	0.739
DF	P05-14	2235.670	4.91E-02	0.952
DF	P06-05	2367.210	1.28E 01	0.000
DF	P06-06	2345.830	7.95E 01	0.000
DF	P06-07	2323.990	3.81E 00	0.022
DF	P06-08	2301.690	1.08E 01	0.000
DF	P06-09	2278.960	6.43E-01	0.526

## 14 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 115 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	1.42E-01	0.868
DF	P06-11	2232.250	1.62E-02	0.984
DF	P06-12	2208.290	9.57E-03	0.990
DF	P06-13	2183.960	2.40E-03	0.998
DF	P06-14	2159.260	5.06E-04	0.999
DF	P07-05	2256.540	6.89E-02	0.933
DF	P07-06	2265.740	6.68E-02	0.935
DF	P07-07	2244.470	5.59E-02	0.946
DF	P07-08	2222.760	5.22E-02	0.949
DF	P07-09	2200.630	2.12E-02	0.979
DF	P07-10	2178.070	2.50E-03	0.998
DF	P07-11	2155.110	6.28E-04	0.999
DF	P07-12	2131.770	2.39E-03	0.998
DF	P08-04	2226.720	7.32E-03	0.993
DF	P08-05	2206.950	1.35E-02	0.987
DF	P08-06	2186.700	9.48E-03	0.991
DF	P08-07	2166.010	9.14E-04	0.999
DF	P08-08	2144.870	2.79E-04	1.000
DF	P08-09	2123.310	1.45E-03	0.999
DF	P08-10	2101.340	5.19E-04	0.999
DF	P08-11	2078.970	1.94E-03	0.998
DF	P08-12	2056.210	4.58E-04	1.000
DF	P09-04	2147.460	5.97E-04	0.999
DF	P09-05	2128.230	4.35E-04	1.000
DF	P09-06	2108.540	7.82E-04	0.999
DF	P09-07	2088.400	1.13E-03	0.999
DF	P09-08	2067.830	1.03E-03	0.999
DF	P09-09	2046.830	1.27E-04	1.000
DF	P09-10	2025.420	2.37E-05	1.000

## 15 km ALTITUDE

0.006 TORR (1000 m) 98 TORR AT -57.0 DEG. C.

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P01-01	2884.943	4.37E-03	0.996
DF	P01-02	2862.647	3.21E-04	1.000
DF	P01-03	2839.786	2.27E-04	1.000
DF	P01-04	2816.376	2.32E-04	1.000
DF	P01-05	2792.432	3.04E-04	1.000
DF	P01-06	2767.967	3.95E-04	1.000
DF	P01-07	2742.998	8.07E-05	1.000
DF	P01-08	2717.540	3.39E-05	1.000
DF	P01-09	2691.608	4.13E-03	0.996
DF	P01-10	2665.217	1.60E-04	1.000
DF	P01-11	2638.384	7.87E-05	1.000
DF	P01-12	2617.124	6.66E-05	1.000
DF	P01-13	2583.453	1.39E-03	0.999
DF	P01-14	2555.388	5.53E-04	0.999
DF	P01-15	2526.943	3.63E-04	0.999
DF	P01-16	2498.135	6.47E-04	1.000
DF	P01-17	2468.980	1.12E-03	0.999
DF	P02-02	2772.440	2.47E-04	1.000
DF	P02-03	2750.084	6.13E-05	1.000
DF	P02-04	2727.304	7.06E-05	1.000
DF	P02-05	2703.997	2.35E-05	1.000
DF	P02-06	2680.177	6.00E-05	1.000
DF	P02-07	2655.862	1.40E-04	1.000
DF	P02-08	2631.065	9.37E-05	1.000
DF	P02-09	2605.804	1.30E-04	1.000
DF	P02-10	2580.093	3.48E-03	0.997
DF	P02-11	2553.948	4.79E-04	1.000
DF	P02-12	2527.385	4.12E-04	1.000
DF	P02-13	2500.418	6.15E-04	0.999
DF	P02-14	2473.065	1.04E-03	0.999
DF	P02-15	2445.339	1.57E-03	0.998
DF	P02-16	2417.258	1.91E-03	0.998
DF	P03-02	2683.950	4.66E-04	1.000
DF	P03-03	2662.211	3.72E-05	1.000
DF	P03-04	2640.075	5.36E-05	1.000
DF	P03-05	2617.384	1.18E-04	1.000
DF	P03-06	2594.193	1.55E-04	1.000
DF	P03-07	2570.516	3.66E-03	0.996
DF	P03-08	2546.367	1.62E-03	0.998
DF	P03-09	2521.763	5.09E-04	0.999

15 km ALTITUDE  
0.006 TORR H<sub>2</sub>O (IN 98 TORR AT -57.° DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P03-10	2496.718	6.63E-04	0.999
DF	P03-11	2471.247	1.37E-03	0.999
DF	P03-12	2445.365	1.58E-03	0.998
DF	P03-13	2419.036	1.89E-03	0.998
DF	P03-14	2392.427	2.33E-03	0.993
DF	P04-02	2597.220	2.24E-04	1.000
DF	P04-03	2576.160	3.46E-04	1.000
DF	P04-04	2554.548	1.03E-03	0.999
DF	P04-05	2532.465	3.27E-04	1.000
DF	P04-06	2509.887	5.05E-04	0.999
DF	P04-07	2486.837	8.15E-04	0.999
DF	P04-08	2463.334	1.23E-03	0.999
DF	P04-09	2439.390	1.66E-03	0.998
DF	P04-10	2414.990	1.94E-03	0.998
DF	P04-11	2390.170	2.77E-03	0.997
DF	P04-12	2364.950	9.02E 00	0.000
DF	P04-13	2339.340	1.24E 03	0.000
DF	P04-14	2313.350	5.48E 00	0.004
DF	P05-03	2491.620	1.89E-03	0.998
DF	P05-04	2470.630	1.08E-03	0.999
DF	P05-05	2449.140	1.66E-03	0.998
DF	P05-06	2427.170	1.79E-03	0.998
DF	P05-07	2404.730	2.17E-03	0.998
DF	P05-08	2381.830	1.81E-01	0.834
DF	P05-09	2358.490	3.10E 01	0.000
DF	P05-10	2334.730	5.16E 00	0.006
DF	P05-11	2310.550	3.08E 00	0.046
DF	P05-12	2285.970	2.13E-01	0.808
DF	P05-13	2261.000	1.16E-01	0.891
DF	P05-14	2235.670	1.95E-02	0.981
DF	P06-05	2367.210	4.94E 00	0.007
DF	P06-06	2345.830	3.24E 01	0.000
DF	P06-07	2323.990	1.44E 00	0.238
DF	P06-08	2301.690	5.63E 00	0.004
DF	P06-09	2278.960	2.92E-01	0.747

## 15 km ALTITUDE

0.006 TORR H<sub>2</sub>O (IN 98 TORR AT -57.0 DEG. C.) (Cont'd)

LASER	LINE	WAVENUMBER (1/cm)	EXTINCTION (1/km)	TRANSMITTANCE AT 1000 M.
DF	P06-10	2255.810	1.03E-01	0.902
DF	P06-11	2232.250	1.17E-02	0.988
DF	P06-12	2208.290	6.92E-03	0.993
DF	P06-13	2183.960	1.79E-03	0.998
DF	P06-14	2159.260	3.68E-04	1.000
DF	P07-05	2286.540	4.99E-02	0.951
DF	P07-06	2265.740	5.03E-02	0.951
DF	P07-07	2244.470	4.07E-02	0.960
DF	P07-08	2222.760	4.47E-02	0.956
DF	P07-09	2200.630	1.54E-02	0.985
DF	P07-10	2178.070	1.82E-03	0.998
DF	P07-11	2155.110	4.70E-04	1.000
DF	P07-12	2131.770	1.75E-03	0.998
DF	P08-04	2226.720	5.29E-03	0.995
DF	P08-05	2206.950	9.93E-03	0.990
DF	P08-06	2186.700	6.96E-03	0.993
DF	P08-07	2166.010	6.66E-04	0.999
DF	P08-08	2144.870	2.05E-04	1.000
DF	P08-09	2123.310	1.22E-03	0.999
DF	P08-10	2101.340	3.95E-04	1.000
DF	P08-11	2078.970	1.41E-03	0.999
DF	P08-12	2056.210	3.32E-04	1.000
DF	P09-04	2147.460	4.54E-04	1.000
DF	P09-05	2128.230	3.23E-04	1.000
DF	P09-06	2108.540	7.15E-04	0.999
DF	P09-07	2088.400	9.82E-04	0.999
DF	P09-08	2067.830	7.53E-04	0.999
DF	P09-09	2046.830	9.62E-05	1.000
DF	P09-10	2025.420	1.93E-05	1.000